Electric rotary module ERS 135 - 210 / 560V

Assembly and Operating Manual

Imprint

Copyright:
This manual remains the copyrighted property of SCHUNK GmbH & Co. KG. It is solely supplied to our customers and operators of our products and forms part of the product. This documentation may not be duplicated or made accessible to third parties, in particular competitive companies,
without our prior permission.

Technical changes:
We reserve the right to make alterations for the purpose of technical improvement.

Document number: 0389064

Edition: 01.07 |13/04/2015|en

© SCHUNK GmbH & Co. KG
All rights reserved.

Dear customer,

congratulations on choosing a SCHUNK product. By choosing SCHUNK, you have opted for the highest precision, top quality and best service.

You are going to increase the process reliability of your production and achieve best machining results – to the customer's complete satisfaction.

SCHUNK products are inspiring.

Our detailed assembly and operation manual will support you.

Do you have further questions? You may contact us at any time – even after purchase.

Kindest Regards

Yours SCHUNK GmbH & Co. KG
Spann- und Greiftechnik

Bahnhofstr. 106 – 134
D-74348 Lauffen/Neckar

Tel. +49-7133-103-0
Fax +49-7133-103-2399

info@de.schunk.com
www.schunk.com

Reg. No. 003496 QM08

Reg. No. 003496 QM08

Table of Contents

1 About this manual 5
1.1 Warnings 5
1.2 Applicable documents 6
2 Basic safety notes 7
2.1 Intended use 7
2.2 Not intended use 7
2.3 General safety notes 7
2.4 Ambient conditions and operating conditions 9
2.4.1 Electromagnetic compatibility 9
2.4.2 Environmental conditions 11
2.5 Personnel qualification 13
2.6 The use of personal protective equipment 13
2.7 Notes on particular risks 14
3 Warranty 18
4 Scope of delivery 19
5 Accessories 19
6 Technical data 20
6.1 Basic Data 20
6.1.1 Data ERS 135 560V 20
6.1.2 Data ERS 170 560V 23
6.1.3 Data ERS 210 560V 26
6.2 SCHUNK power and sensor cable 29
6.3 Optional holding brake 29
6.4 Pneumatic/electrical feed-through option 30
6.5 IP54 version 30
7 Design and description 31
7.1 Design 31
7.2 Description 31
7.3 Mechanische Schnittstellen 32
7.4 Electrical interfaces 32
7.5 Type key and name plate 33
7.6 Optional holding brake 34
8 Assembly 35
8.1 Mechanical connection 35
8.2 Electrical connection 38

8.3 Optional holding brake 42
8.3.1 Electrical connection 43
8.3.2 Dismantling micro valve 44
8.3.3 Installing and connecting the micro valve 45
8.3.4 Realigning the connection cable 47
9 Start-up 48
9.1 Start-up of the Bosch Rexroth IndraDrive C/CS 49
9.2 Start-up of the Siemens Sinamics S120 CU310/CU320 58
9.3 Inbetriebnahme des ERS mit einem beliebigen Umrichter 79
10 Control parameters 80
10.1 Bosch Rexroth IndraDrive C/CS-Basic setting 80
10.2 Siemens Sinamics S120 - series 81
11 Trouble shooting 85
11.1 ERS dreht sich nicht 85
11.2 ERS has regulation difficulties 86
11.3 ERS oscillates 86
11.4 Bearing noise 86
11.5 Error message for the winding temperature 87
12 Maintenance and care 88
12.1 Maintenance and lubrication intervals 88
12.2 Module Servicing 89
12.3 Modul zerlegen 89
13 Transport, storage and disposal 90
13.1 Transport 90
13.2 Packaging 90
13.3 Storage 91
13.4 Disposal 91
14 Assembly drawings 92
14.1 ERS 135 92
14.2 ERS 170 93
14.3 ERS 210 94
15 Translation of original declaration of incorporation 95
15.1 Annex to Declaration of Incorporation 96

1 About this manual

This instruction is an integral part of the product and contains important information for a safe and proper assembly, commissioning, operation, maintenance and help for easier trouble shooting.

Before using the product, read and note the instructions, especially the chapter "Basic safety notes".

1.1 Warnings

To make risks clear, the following signal words and symbols are used for safety notes.

DANGER

Danger for persons.
Non-compliance will inevitably cause irreversible injury or death.

WARNING

Dangers for persons.
Ignoring a safety note like this can lead to irreversible injury and even death.

CAUTION

Dangers for persons.
Non-observance can cause minor injuries.

NOTICE

Material damage
Information about avoiding material damage.

WARNING

Warning about dangerous electrical voltage

WARNING

Warning about hot surfaces

1.2 Applicable documents

- General terms of business
- Catalog data sheet of the purchased product
- Assembly and Operating manuals of the accessories
- SCHUNK CD with:
  - Parameterfiles for controller Bosch Rexroth IndraDrive C/CS
  - Parameterfiles for controller Siemens Sinamic S 120 CU310-DP and S 120 CU320-DP

The documents listed here, can be downloaded on our homepage **www.schunk.com**

2 Basic safety notes

2.1 Intended use

The product was designed to rotate loads, workpieces and objects.

The poduct may only be operated in combination with a controller.

The product is intended for installation in a machine/system. The requirements of the applicable guidelines must be observed and complied with.

The product may be used only in the context of its defined application parameters (☞ 6, Page 20).

The product is designed for industrial use.

To use this unit as intended, it is also essential to observe the technical data and installation and operation notes in this manual and to comply with the maintenance intervals.

2.2 Not intended use

Use which is not specified as an intended use is for instance when the product is for example used as a pressing tool, stamping tool, lifting tool, guide for tools, cutting tool, tensioning mean, boring tool.

2.3 General safety notes

- Observe these safety notes and supplementary instructions for use prior to starting work with the product.
- Carefully read through all the documents supplied before starting up or using the product.
- Please refer to the documentation for the connecting and installing conditions and the technical data and restrictions and observe these at all times. Every person called upon by the operator to work on the product must have read and understood the complete assembly and operating manual. This applies in particular to occasional personnel, such as maintenance personnel.
- The product may pose a danger, for instance in the following situations:
  - When the product is not used in accordance with its appropriate use.
  - When the product is not installed or maintained properly.
  - When the safety notes or assembly instructions are not observed.

- Avoid any manner of working that may interfere with the functioning and operational safety of the product.
- Do not start up a damaged or faulty product.
- Only use spare parts and accessories that have been authorized by SCHUNK. Leave the hardware components in their original state and do not manipulate them or the software without the express consent from SCHUNK. Additional bore holes, threads or attachments, that are not offered by SCHUNK as accessories, may impair the safety of the product and are only permitted with the approval of SCHUNK.
- Error-free and safe operation of the product requires proper transportation and storage, observation of the assembly and installation regulations that apply to the product, as well as careful and responsible operation and servicing.
- Improper handling of the product, failing to observe the safety notes and manipulating the maintenance products may damage the product and also cause serious injury.
- A risk assessment must be created for the system or machine into which the product is to be installed. The operator must product monitoring strategies and superordinate measures for personal protection based on the risk analysis. In this the safety rules that apply to the entire system or machine must be taken into account.

2.4 Ambient conditions and operating conditions

- The module may be used only in the context of its defined application parameters.(☞ 6, Page 20).
- Operate the procuct protected against splashes,, fumes, polltion and EMC influences.

2.4.1 Electromagnetic compatibility

The module fulfills the requirements of the EMC law of the Single European Market. The devices passed the EMC test in accordance with the following standards:

Standard	Title
EN 61000-6-2 (2006)	EMC: Generic standard – Immunity in industrial environments
EN 61000-6-3 (2011)	EMC: Generic standard – Emission standard for residential and light industrial environments

The EMC-compliant installation of the product and the use of interference resistant wiring are necessary for trouble-free operation.

Interference variables: Pulsed interference variables:
The following table shows the electromagnetic compatibility with respect to pulsed interference variables.

Pulsed interference variable	Tested with	Corresponds to intensity
Electrostatic discharge according to EN 61000-4-2 (2008)	Air discharge: 8 kV Contact discharge: 4 kV	3
Burst pulse, fast transient interference variables according to EN 61000-4-4 (2008)	Supply line: + - 2 kV On signal, data and control line: + -1kV	3
High-energy single pulse (surge) EN 61000-4-5	+ - 500V, surge symmetrical, + - 500V, surge asymmetrical (length of lead > 30 m)	1

Sinusoidal interference variables:
The following table shows the electromagnetic compatibility with respect to sinusoidal interference variables

Sinusoidal interference variable	Test values	Corresponds to intensity
HF irradiation (electromagnetic fields) according to EN 61000-4-3	80 % amplitude modulation at 1kHz to 10 V/m in the range from 80 … 1000 MHz to 3 V/m in the range from 1.4 … 2 GHz to 1 V/m in the range from 2 … 2.7 GHz	3
HF energizing on lines and shields according to EN 61000-4-6	Test voltage 10 V with amplitude modulation 80 % of 1 kHz in the range from 150 kHz … 80 MHz	3

Emission of radio interference

The emission was tested according to EN 61000-6-3 and confirmed.

Wire conducted emission	Value
0.15 … 0.5 MHz	< 66 dB (µV) quasi peak, < 56 dB (µV) mean value
0.5 … 5 MHz	< 56dB (µV) quasi peak, < 46 dB (µV) mean value
5 … 30 MHz	< 60 dB (µV) quasi peak, < 50 dB (µV) mean value

The following table shows the emission of electromagnetic fields according to EN 55011:2009, limit class A, group 1, measured at a distance of 10 m

Interference variable	Value
30 … 230 MHz	< 30 dB (µV) quasi peak, measured at 10 m
230 … 1000MHz	< 37 dB (µV) quasi peak, measured at 10 m

2.4.2 Environmental conditions

Requirements for transport and storage

This product exceeds the requirements of IEC 61131-2:2007 with respect to permissible environmental conditions. The following information applies if the product is transported and stored in the original package.

Mechanical environmental conditions Standard: IEC 60721-3-2 (version 1. 3. 1997) Title: Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities, Section 2: Transportation. Class 2M2 applies.

Climatic environmental conditions Standard: IEC 60721-3-2 (version 1. 3. 1997) Title: Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities, Section 2: Transportation. Class 2K4 applies.

The aforementioned standards result in the following parameters for the essential environmental conditions. The information applies if the product is transported and stored in the original package.

Environmental condition	Value	Note
Free fall EN 60068-2-32	<= 0.3 m	In the transport package: 5 g
Temperature EN 60068-2-2	+70° C	Test Bb, dry heat, storage
Temperature EN 60068-2-1	-40° C	Test Ab, cold, storage
Temperature shock EN 60068-2-14	-40 … +70° C	Test Na, holding time 3 h, 5 cycles
Air pressure IEC 60068-2-13	1140 … 660 hPa	Corresponds to an elevation of -1000 … 3500 m

Requirements during operation

The following overview shows the permissible environmental conditions for the product.
Mechanical environmental conditions Standard: IEC 60721-3-2 (version 1. 3. 1997) Title: Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities, Section 3: Stationary use at weather-protected locations. Class 3M3 applies.

Climatic environmental conditions Standard: IEC 60721-3-2 (version 1. 3. 1997) Title: Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities, Section 3: Stationary use at weather-protected locations. Class 3K3 applies

The aforementioned standards result in the following parameters for the essential environmental conditions.

Environmental condition	Value	Note
Temperature EN 60068-2-2	+55° C	Relative humidity 55 , non-condensing, dry heat, in operation
Temperature EN 60068-2-1	0° C	Cold, storage, in operation
Temperature EN 60068-2-30	+25 … +55° C	Humid heat, cyclic

The product may be used at the following locations only if additional measures are taken:

- locations with high content of ionizing radiation
- locations with extreme operating conditions, such as caustic vapors, gases, oils or chemicals
- systems requiring special monitoring, such as high-risk rooms

In addition, the product is not approved for use in potentially explosive zones. If the product is subjected to excessively high jolts or vibrations, suitable measures must be taken to damp the amplitudes or accelerations of these interference factors. In such cases, use systems to damp or eliminate the vibrations.

Tests under environmental conditions

Tests with respect to mechanical environmental conditions

The following table shows the type and scope of inspections for which the product was tested with respect to mechanical environmental conditions.

Test	Physical variable	Value, comment
Vibrations EN 60068-2-6 (Version 2008)	Vibration	Sinus
	Frequency range	5 … 500 Hz Deflection 10 mm
		5 … 500 Hz Vibration acceleration 30 m/s^2
Shock EN 60068-2-27 (Version 2009)	Shock form	Half-sine
	Peak acceleration	250 m/s^2
	Pulse duration	11 ms
	Number of shocks per direction	50 per axis
	Number of axes	3

2.5 Personnel qualification

- Only qualified personnel may operate the product or work in its vicinity.
- Personnel must be familiar with the required safety equipment, know how to use it and be trained in First Aid.
- Work on the electrical installations shall only be performed by electricians or instructed personnel under the guidance and supervision of an electrician, and in accordance with the electrical standards.
- Observe the national accident prevention regulations and the general safety notes.

2.6 The use of personal protective equipment

When installing or removing the product, observe the relevant health and safety at work rules and use the required personal protective equipment (protective gloves, safety boots and safety goggles).

2.7 Notes on particular risks

General information

- Observe safe distances.
- Observe the minimum safety requirements for the use of equipment.
- Never take maintenance product out of operation.
- Install the provided protective product in the danger zone before switching the product on.
- Remove the energy supplies before installation, modification, maintenance, or adjustment work. Ensure that no residual energy remains in the system.
- Do not move parts by hand when the energy supply is connected.
- Do not reach into the open mechanism or the movement area of the unit.
- Perform maintenance, modifications, and additions outside the danger zone.
- During all work, secure any product attached to controller against accidental operation.
- Take particular care during maintenance and disassembly.
- Only trained staff may perform disassembly work.

Protection during handling and assembly

- There is a risk of injury when handling the product incorrectly. Only trained staff may perform maintenance and assembly work. For all work, secure the product against accidental operation.
- Observe the relevant accident prevention rules.
- Use suitable assembly and transport equipment and take precautions to prevent jamming and crushing.

Protection against dangerous movements

Dangerous movements may be caused by faulty actuation of drives that are connected

Dangerous movements may be caused by operating mistakes or faulty parameterization during start-up or by software errors.

- Never rely merely on the response of the monitoring function to avert danger. Assume that the drive movement is faulty as long is the installed monitors are not effective, since the effect depends on the control and the current operating state of the drive. Perform maintenance, modification and attachment work outside of the danger zone defined by the movement range.
- To avoid accidents and/or material damage, access to the movement area of the machine must be restricted. Restrict accidental access of persons in this area, e.g. by providing a protection cover, a protective fence or a photoelectric barrier. The protection cover and the protective fence must have sufficient stiffness to withstand the maximum possible movement energy. EMERGENCY STOP switches must be easily accessible. Before starting up the machine or system, check that the EMERGENCY STOP system is working. Prevent operation of the machine if this protective equipment does not function.

Electric components

- Work on the electrical installations shall only be performed by electricians or instructed personnel under the guidance and supervision of an electrician, and in accordance with the electrical standards.
- Observe the general set-up and safety rules applicable when performing work on power plants.
- Lay electric lines according to the rules of the profession, e.g. in a cable duct or a cable bridge. Observe cable laying standards.
- Before connecting or disconnecting electric cables, switch off the power supply and check that lines are dead. Secure power supply against reactivation.

- Disconnect the product from the mains prior to commencing work on it and wait for at least 15 minutes for dangerous voltages to disappear (capacitor charge). Check that the product is deenergized before you start work.
- Before switching on the product, check whether the protective conductor on all electric components has been installed correctly and according to the connection diagram.
- Check whether covers and protective equipment have been attached to prevent touching live components.
- Do not touch the connecting elements of the product, when the power supply is switched on.

Magnetic and electromagnetic fields

- Persons with pace-makers, metal implants, metal shards or hearing aids require the consent of a physician before entering areas in which components of the electric drive and control systems are mounted, started up and operated.
- Persons with pace-makers, metal implants, metal shards or hearing aids required the consent of a physician before entering areas in which motor parts with permanent magnets are stored, repaired or assembled.
- Do not operate high-frequency or radio products in the proximity of electric components of the drive system and their feed lines. If using such devices is necessary: Check the machine or system for possible failures when using such devices at different intervals and in different states of the control system when starting-up of the electric drive and control system. You may need to carry out an additional specific EMC control if the system's risk potential is high.

Hot surfaces

- Do not touch hot surfaces (e.g. brake resistors, heat sinks, drive units, windings and sheet packets). It may take up to one hour for some components to cool off after they have been switched off. If necessary, wear personal protective equipment (gloves).

DANGER

Risk of electric shock due to contact with live parts!

- Before conducting work on the machine and the auxiliary equipment, disconnect them from the power supply and make sure they cannot be switched back on again.
- Wait until the frequency controller is discharged.

WARNING

Risk of injury from objects falling and being ejected

- The danger zone must be surrounded by a safety fence during operation.

WARNING

Risk of injury due to moving parts if these are controlled incorrectly!

Possible causes for control errors:

- Incorrect cabling or wiring
- Removal of safety devices
- Software errors
- Sensor and signal transmitter errors
- Entry of incorrect parameters prior to start-up
- Defective module

WARNING

Risk of burns due to contact with hot surfaces!

During operation, the surface temperature may exceed 105°C (221°F).

- Allow the module to cool down to at least 40°C (104°F) before working on the module.
- Measure the surface temperature before touching the module.
- Wear protective gloves, if necessary.

3 Warranty

If the product is used as intended, the warranty is valid for 24 months from the date of delivery from the production facility under the following conditions:

- Observance of the ambient conditions and operating conditions (☞ 2.4, Page 9)
- Observe the mandatory maintenance and lubrication intervals.(☞ 12, Page 88)

Parts touching the work piece and wearing parts are not part of the warranty.

4 Scope of delivery

The scope of delivery includes

- Electric rotary module ERS in the ordered model.
- SCHUNK CD with:
  - Parameter files for Bosch Rexroth IndraDrive C/CS converter
  - Parameter files for Siemens Sinamic S 120 CU310-DP and S 120 CU320-DP converters
- Accessory pack

5 Accessories

The following accessories that are required for the module must be ordered separately:

- Cable set (power/sensor cables)
- Y-junction ID-No. 9957232
- Sensor cable ID-No. 9957233

The following accessories are required for the module:

- Controller:
  Bosch IndraDrive C /CS incl. User's Manual
  or
  Siemens Sinamics S 120 CU310-DP or S 120 CU320-DP incl. User's Manual

For information about which accessories can be used with the appropriate product version ☞ catalog.

6 Technical data

6.1 Basic Data

More technical data are included in the catalog data sheet. Whichever is the latest version.

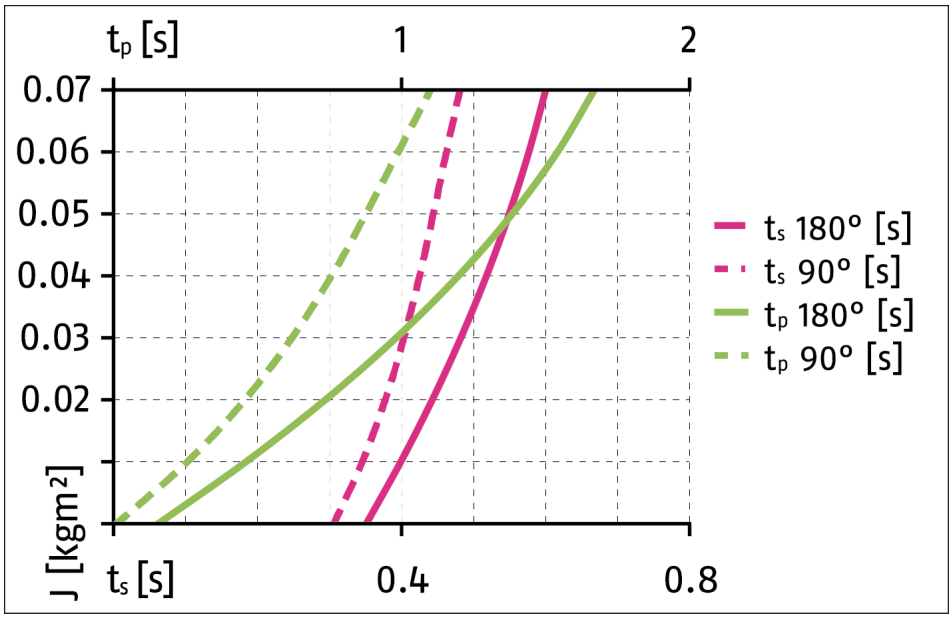
6.1.1 Data ERS 135 560V

NOTE
The Rotary Module ERS has to be mounted on a thermally well-conducting surface.

Mechanical operating data	
Heat conduction surface [mm²]	57686
Weight [kg]	2.7
Dimension	135 x 63
Center bore (Ø) [mm]	15
Ambient temperature [°C] Min. Max.	 +5 +55
Mass moment of inertia of rotating parts [kgm²]	0.001431
Max. permissible mass moment of inertia [kgm²]	0.072
Rotation range [°]	>360 (turning endlessly)
Repeat accuracy [°]*	0.01
* Distribution of the end positions of 100 successive motions. When approaching from the same direction.	
Measuring system	Incremental
IP rating	40
Permissible operating mode	S1 - continuous operation**
** Applies only if the preconditions in chapter "Mechanical connection" (☞ 8.1, Page 35) are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode.	
Specifications for the integrated motor	
Motor type	Synchronous
Circuit	Star
Temperature sensor (type)	KTY84-130
Max. permissible operating temperature [°C]	+95

Insulation class	Class F DIN 57530
Output shaft power P_n [kW]	0.24
Intermediate circuit voltage U_{ZK} [V]	560
Rated torque M_n [Nm]	2.5
Nominal current [A_{rms}]	1.2
Peak current I_{max} [A_{rms}]	3.8
Torque constant K [Nm/A_{rms}]	1.9
Rated speed n_n [rpm]	1000
Max. speed n_{max} [rpm]	2300
Winding resistance (phase-phase) R20 [ohm]	26.5
Winding inductivity (phase-phase) L20 [mH]	42.68
Number of pole pairings N	15
Specifications for the integrated measuring system	
Type	1V sin-cos signal (analog), magnetic measuring system with reference track
Power supply [VDC]	5 ±10%
Mean current input [mA]	25
Number of poles	160

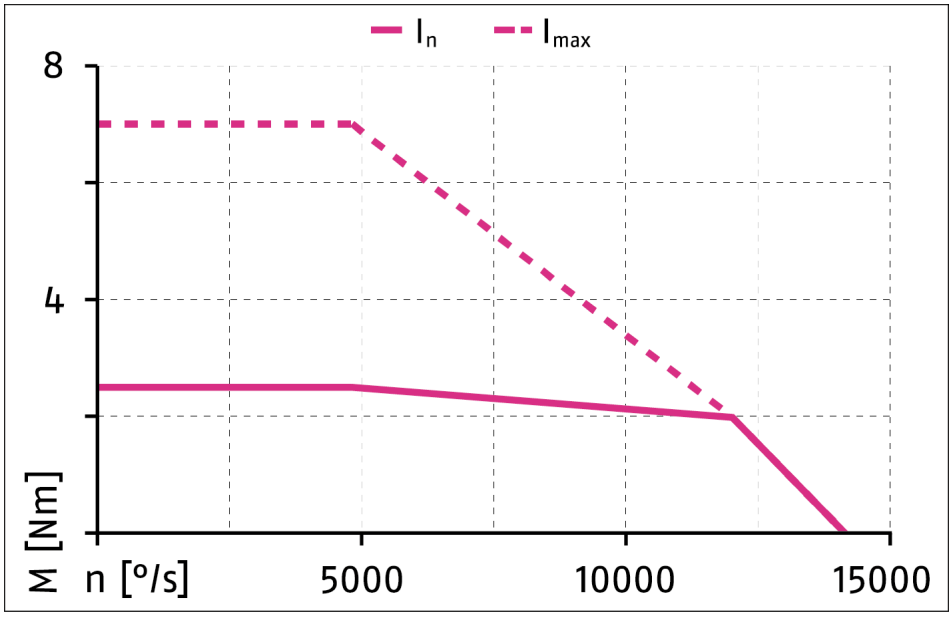
Swiveling time diagram



Swiveling time diagram ERS 135 560V

t_s	swing time	t_p	pulse off time

Torque characteristic



Torque characteristic ERS 135 560V

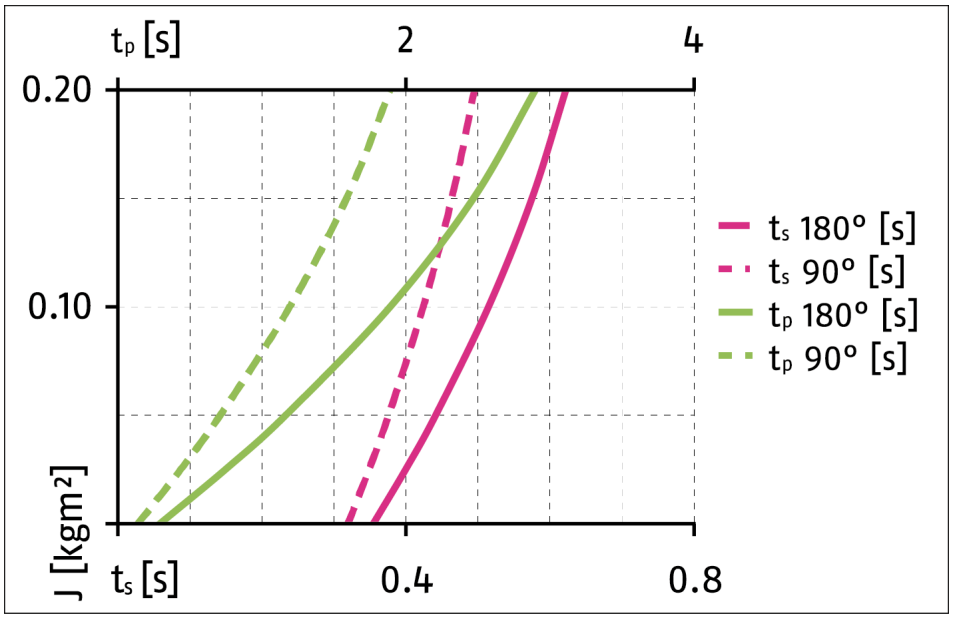
6.1.2 Data ERS 170 560V

NOTE
The Rotary Module ERS has to be mounted on a thermally well-conducting surface.

Mechanical operating data	
Heat conduction surface [mm²]	49302
Weight [kg]	4.7
Dimension	170 x 66
Center bore (Ø) [mm]	32
Ambient temperature [°C] Min. Max.	 +5 +55
Mass moment of inertia of rotating parts [kgm²]	0.003859
Max. permissible mass moment of inertia [kgm²]	0.20
Rotation range [°]	>360 (turning endlessly)
Repeat accuracy [°]*	0.01
* Distribution of the end positions of 100 successive motions. When approaching from the same direction.	
Measuring system	Incremental
IP rating	40
Permissible operating mode	S1 - continuous operation**
** Applies only if the preconditions in chapter "Mechanical connection" (☞ 8.1, Page 35) are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode.	
Specifications for the integrated motor	
Motor type	Synchronous
Circuit	Star
Temperature sensor (type)	KTY84-130
Max. permissible operating temperature [°C]	+95
Insulation class	Class F DIN 57530
Output shaft power P_n [kW]	0.37
Intermediate circuit voltage U_{ZK} [V]	560
Rated torque M_n [Nm]	5.0
Nominal current [A_{rms}]	1.6
Peak current I_{max} [A_{rms}]	5.65

Torque constant K [Nm/A_{rms}]	3.1
Rated speed n_n [rpm]	700
Max. speed n_{max} [rpm]	1600
Winding resistance (phase-phase) R20 [ohm]	17.1
Winding inductivity (phase-phase) L20 [mH]	24.9
Number of pole pairings N	15
Specifications for the integrated measuring system	
Type	1V sin-cos signal (analog), magnetic measuring system with reference track
Power supply [VDC]	5 ±10%
Mean current input [mA]	25
Number of poles	216

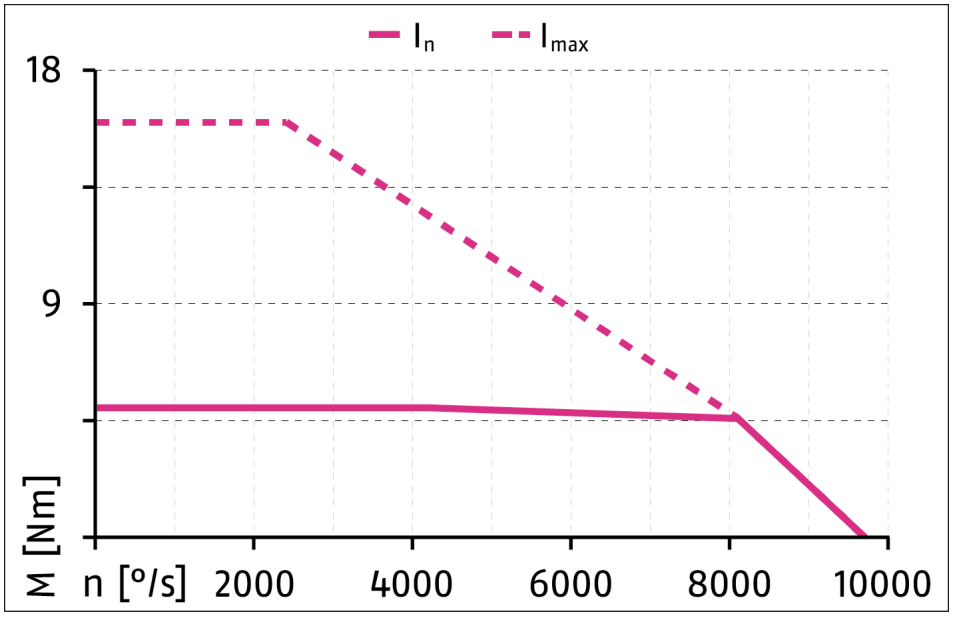
Swiveling time diagram



Swiveling time diagram ERS 170 560V

t_s	swing time	t_p	pulse off time

Torque characteristic



Torque characteristic ERS 170 560V

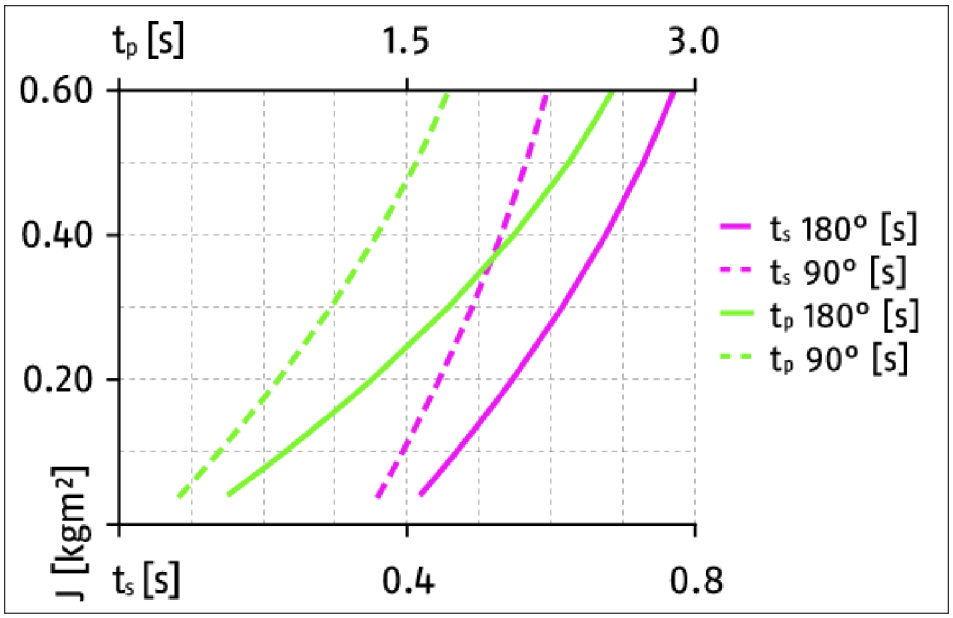
6.1.3 Data ERS 210 560V

NOTE
The Rotary Module ERS has to be mounted on a thermally well-conducting surface.

Mechanical operating data	
Heat conduction surface [mm²]	37363
Weight [kg]	7.8
Dimension	210 x 77
Center bore (Ø) [mm]	40
Ambient temperature [°C] Min. Max.	 +5 +55
Mass moment of inertia of rotating parts [kgm²]	0.011278
Max. permissible mass moment of inertia [kgm²]	0.6
Rotation range [°]	>360 (turning endlessly)
Repeat accuracy [°]*	0.01
* Distribution of the end positions of 100 successive motions. When approaching from the same direction.	
Measuring system	Incremental
IP rating	40
Permissible operating mode	S1 - continuous operation**
** Applies only if the preconditions in chapter "Mechanical connection" (☞ 8.1, Page 35) are fulfilled. Otherwise, S6 - continuous mode with intermittent load is the permitted operating mode.	
Specifications for the integrated motor	
Motor type	Synchronous
Circuit	Star
Temperature sensor (type)	KTY84-130
Max. permissible operating temperature [°C]	+95
Insulation class	Class F DIN 57530
Output shaft power P_n [kW]	0.63
Intermediate circuit voltage U_{ZK} [V]	560
Rated torque M_n [Nm]	10
Nominal current [A_{rms}]	1.68
Peak current I_{max} [A_{rms}]	5.67

Torque constant K [Nm/A_{rms}]	5.6
Rated speed n_n [rpm]	600
Max. speed n_{max} [rpm]	1000
Winding resistance (phase-phase) R20 [ohm]	16.6
Winding inductivity (phase-phase) L20 [mH]	58.12
Number of pole pairings N	16
Specifications for the integrated measuring system	
Type	1V sin-cos signal (analog), magnetic measuring system with reference track
Power supply [VDC]	5 ±10%
Mean current input [mA]	25
Number of poles	216

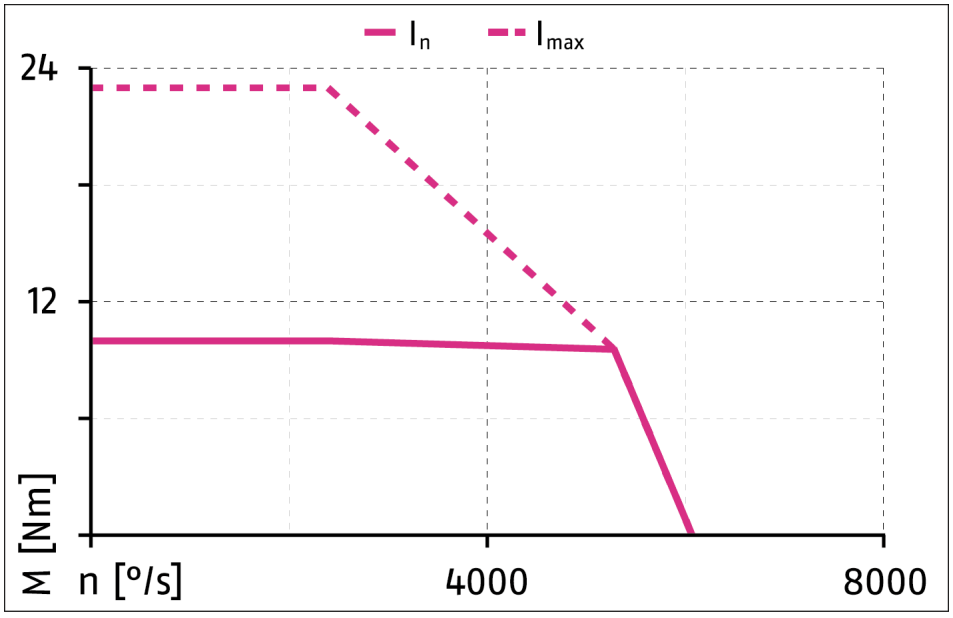
Swiveling time diagram



Swiveling time diagram ERS 210 560V

t_s	swing time	t_p	pulse off time

Torque characteristic



Torque characteristic ERS 210 560V

6.2 SCHUNK power and sensor cable

Cable type	Power	Transducer
Number of wires/cross-section	4x0.75 mm² + 2x0.25 mm² + 2x0.25 mm²	8x0.25 mm²
Max. voltage [V]	600	24
Shielded	Yes	Yes
Shield around individual wire strands	No	Yes
Twisted	No	Yes
Temperature application range [°C]	+5 to +55	+5 to +55
Max. cable length [m]	20	20

NOTE
Comply with the minimum bending radius, 7.5 times the cable diameter.

6.3 Optional holding brake

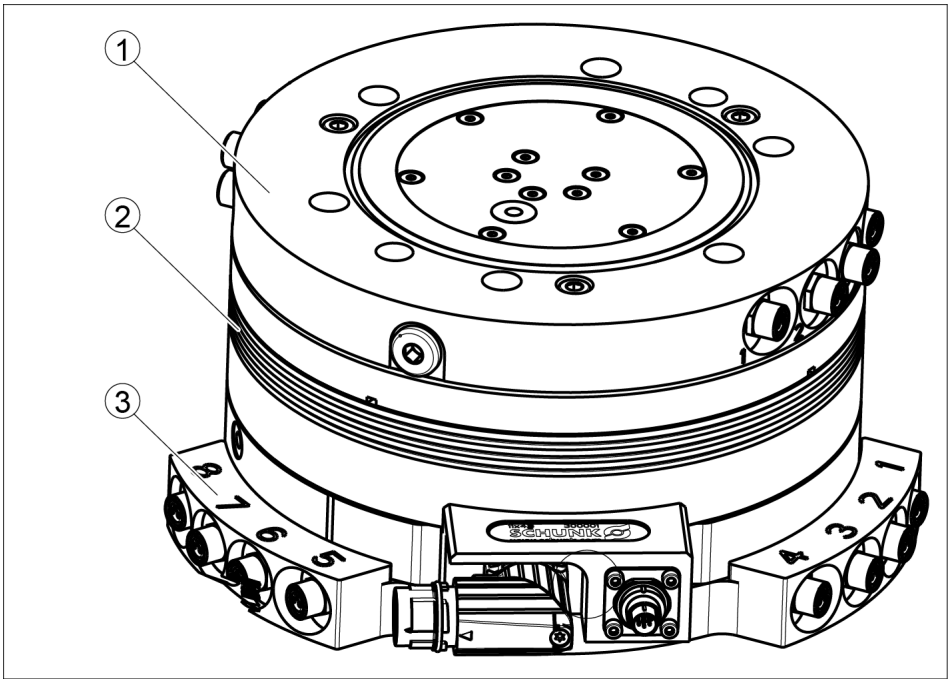
Micro valve MV15

Reference value	ERS 135	ERS 170	ERS 210
Hose connection diameter internal [mm]	4		
Pressure medium	Filtered compressed air, oiled or dry, compressed air purity acc. to ISO 8573-1:2010 [7:4:4]		
Nominal flow rate at 6 bar [Nl/min]	45		
Operating pressure P [bar]	4.5 - 6		
Power consumption [W]	2.8		
Nominal voltage [VDC]	24 (+10% / -5%)		
Brake torque [Nm]	2.5	5.0	10.0
Opening/closing time of the brake at 4.5 bar [ms] Opening Closing	 100 100	 200 200	 100 100

More technical data are included in the catalog data sheet. Whichever is the latest version.

6.4 Pneumatic/electrical feed-through option

	NOTICE
	Irreparable damage to the DDF due to high RPM! • The maximum permitted RPM of the DDF option is 250 RPM.



Design of the DDF variant

1	"Output side" flange
2	Basic module ERS
3	"Input side" connection baseplate

6.5 IP54 version

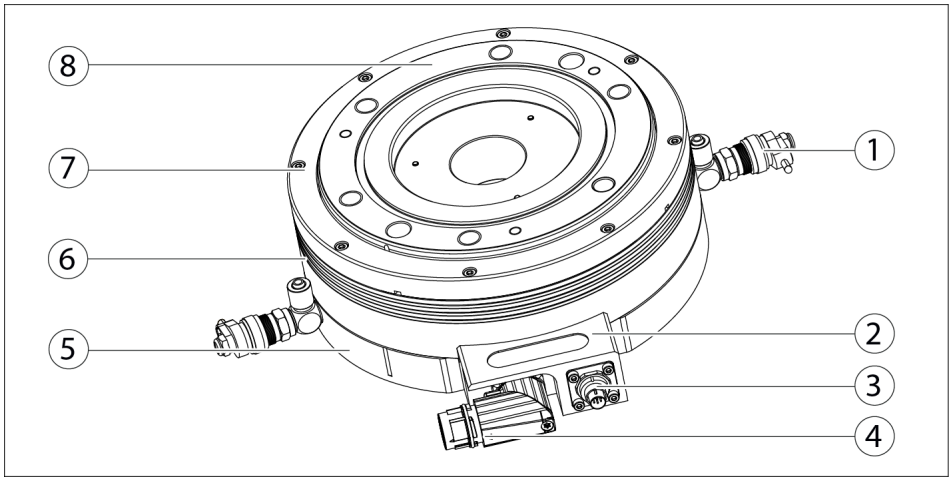
NOTE

Due to the installed rotary seal version IP54 has lower technical data as version IP40.

IP rating	1. key number	2. key number
IP 54	Protected against dust in harmful quantity.	Protection against splashing water from all sides.

7 Design and description

7.1 Design



ERS components

1	Micro valve	5	Basic carrier (fixed)
2	Plug-in connection	6	Bearing flange
3	Plug (sensor cable)	7	Sealing flange
4	Plug (power cable)	8	Rotor (moving)

7.2 Description

Overview

The ERS is a completely mounted, permanently excited synchronous in a cylindrical housing with a center bore.

Der ERS besitzt ein integriertes Positionsmesssystem. In der Motorwicklung ist ein Temperatursensor integriert.

Torque motor

The ERS belongs to the category of torque motors. The typical characteristics of a torque motor are its high torque, low speeds and a strong rigidity.

Area of application

The ERS is used typically for rotating and pivoting of large masses. The center bore can be used as a media feed-through.

Operating modes

The ERS must be operated using a controller. The following operating modes may be selected.

- power-contolled
- speed-controlled
- position-controlled

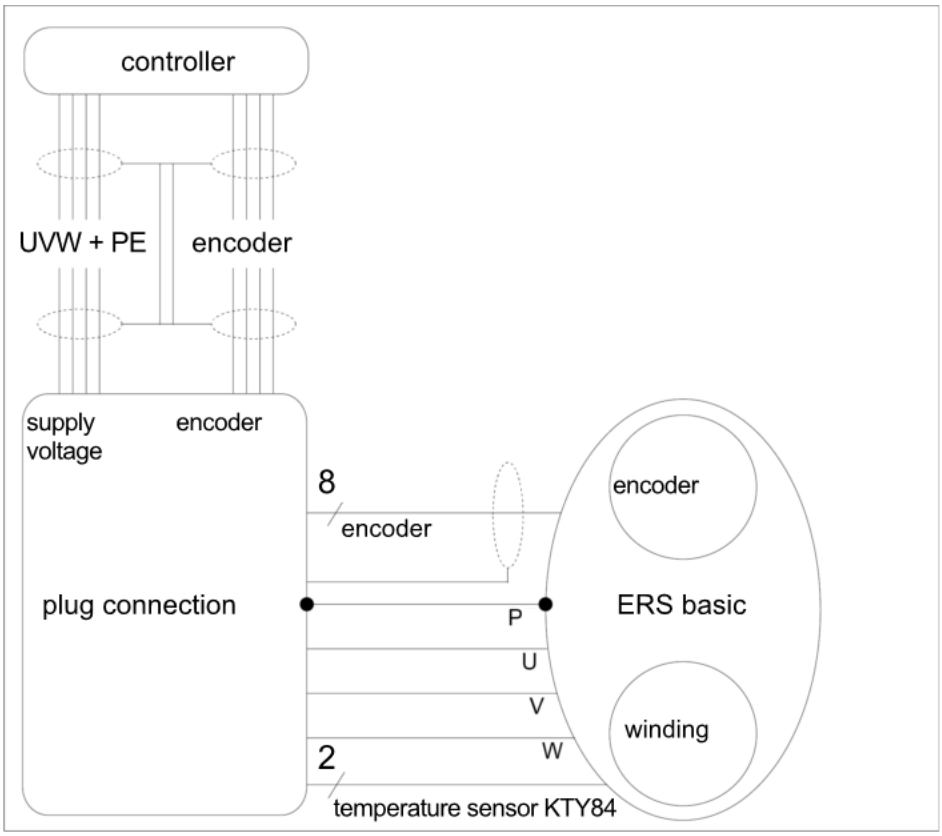
7.3 Mechanische Schnittstellen

Maintenance-free lubrification

The ERS is mounted on a single four point bearing. This bearing is lubricated via one-time grease lubrication. Under normal operating conditions lubrication for 20.000 operating hours is sufficient. (☞ 12.1, Page 88).

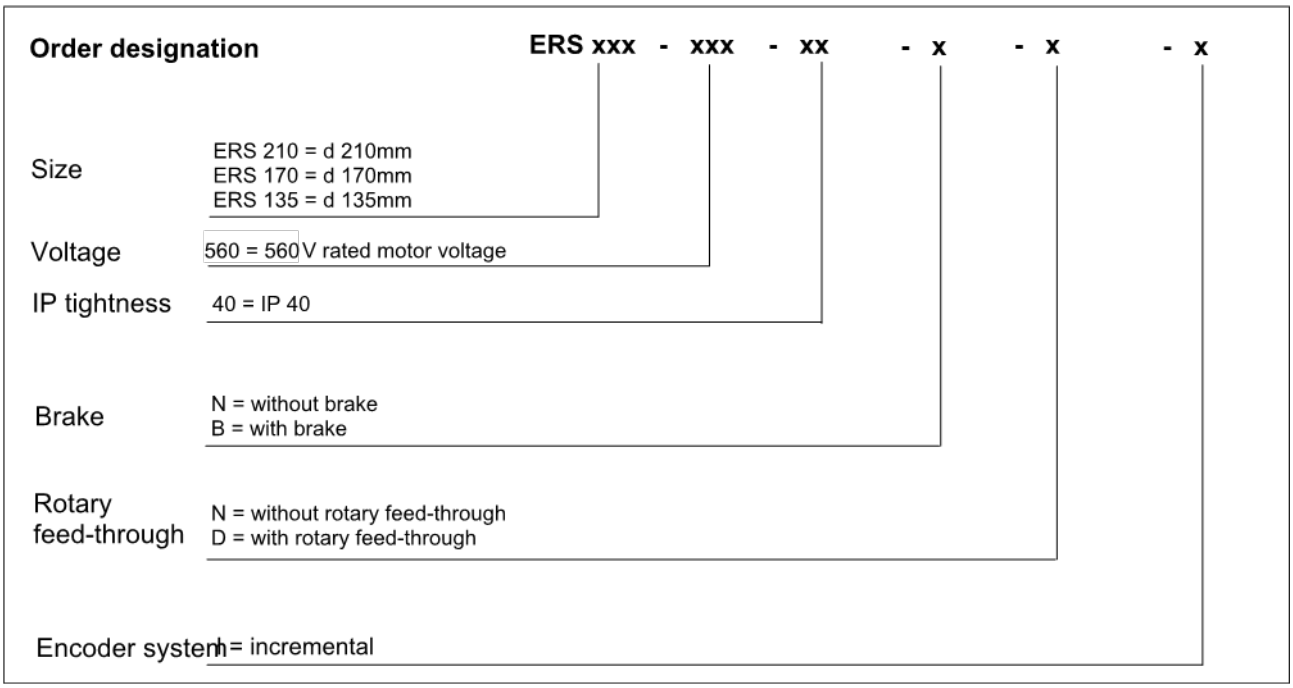
Position of the mechanical interfaces
(☞ 14, Page 92)

7.4 Electrical interfaces



ERS circuit diagram

7.5 Type key and name plate



Type key and name plate

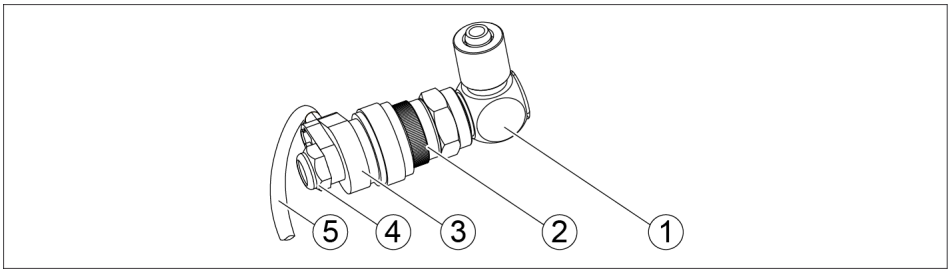
The nameplate is attached to one of the broad sides of the module.

Specifications on the name plate (example ERS 210 560V)

Designation	Specification
Manufacturer	Schunk GmbH & Co. KG
Type / model - protection class	ERS210-560-40-B-N-I
ID	0310xxx
Rated torque (M_N)	10 Nm
Voltage (U_N)	560 V
Current (I_N)	1.8 A

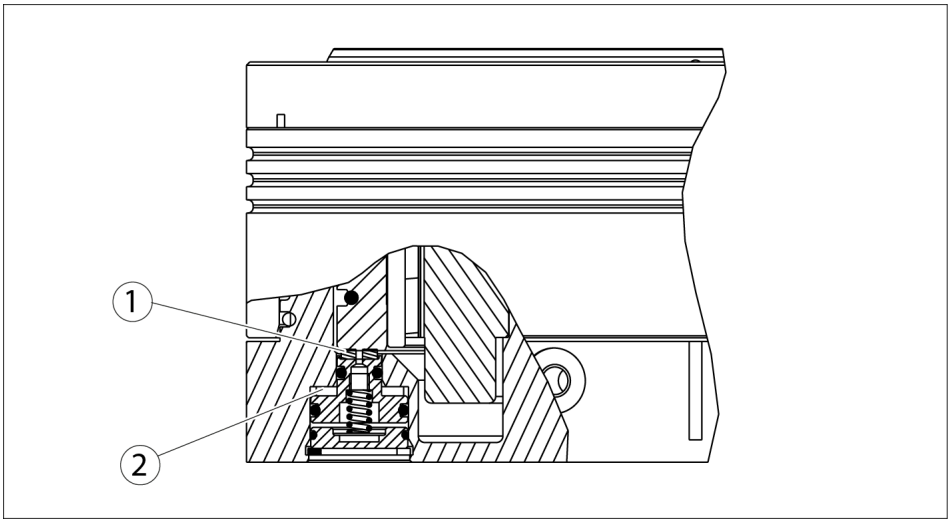
7.6 Optional holding brake

	NOTICE **This is a holding brake and not a service brake!**



Micro valve MV15

1	Swivel fitting	3	Valve cover
2	Cartridge	4	Sound absorber
5	Connection cable		



Brake option

1	Contact surface between brake pad and rotor
2	Pre-loaded brake piston with brake pad

NOTE

The micro valve is closed if there is no voltage at the micro valve. In this state, the holding brake is active.

The micro valve is opened if there is voltage at the micro valve. In this state, the holding brake is inactive.

8 Assembly

8.1 Mechanical connection

⚠ WARNING

Risk of injury when the machine/system moves unexpectedly!

- Remove the energy supplies.
- Make sure, that no residual energy remains in the system.

NOTICE

Malfunction due to mechanical stress in the housing possible!

- Observe the requirements for the evenness of the mounting surface.

Check the evenness of the bolting surface

The values relate to the entire bolting surface.

Requirements for levelness of the bolting surface (Dimensions in mm)

Diameter	Permissible unevenness
< 100	< 0.02
> 100	< 0.05

Prerequisites

Depending on the load, it is necessary to make sure that the resulting power losses are dissipated.

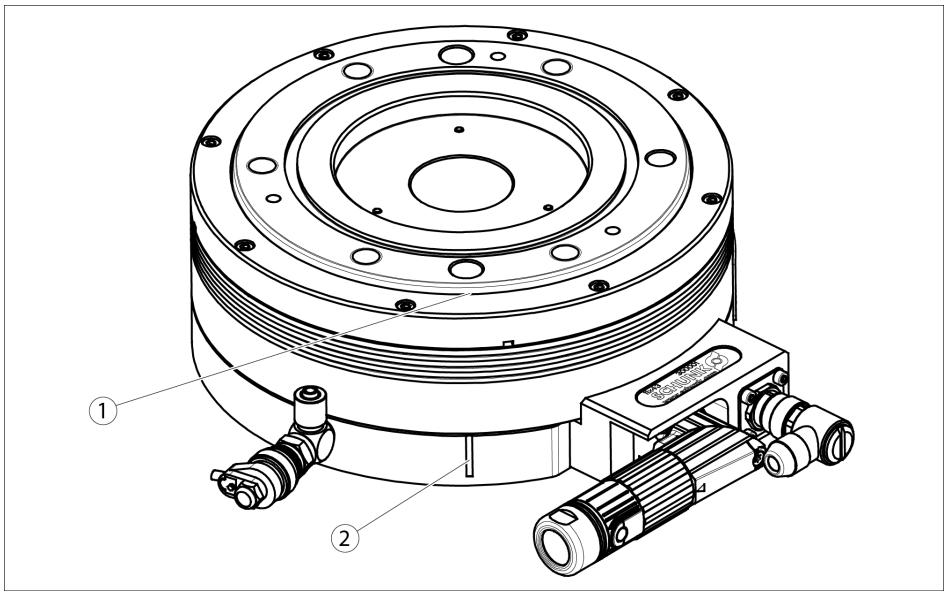
- The ERS must be mounted on a surface with good thermal conductive properties.

To achieve the IP protection class 40:

- Design the connection structure so that no chips, cooling water or dirt can enter the ERM's connection area from the working area.

NOTE

Note the position of the reference mark during installation.



Position of the reference marks

1	Indexing pulse	2	Encoder sensor

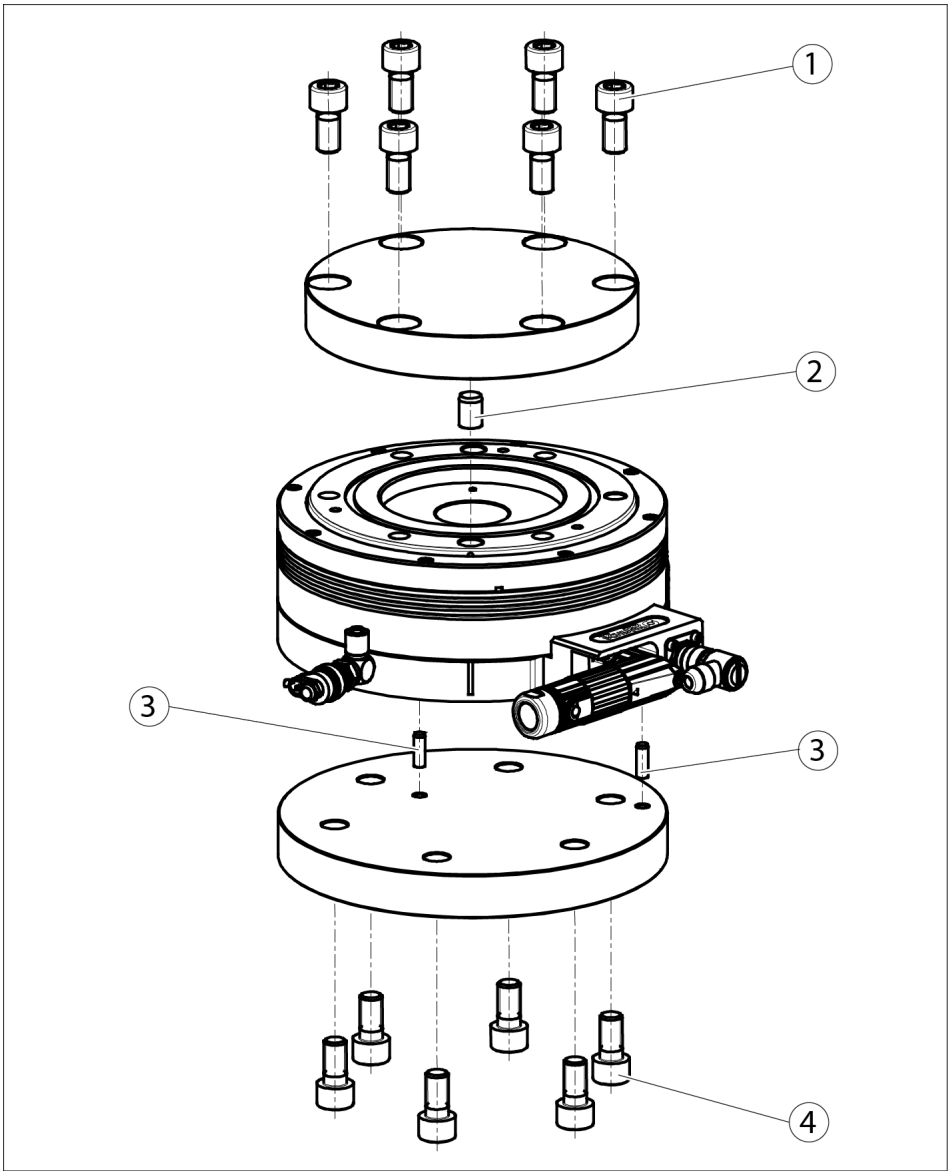
Assembly

1 Make sure that the interfaces to attachments are clean and undamaged.

2 Mount the rotary module on the machine via the corresponding interface. Six fastening screws are required for each fastening side.

NOTE

All dimensions of the drawings can be taken from our website at www.schunk.com under "CAD data service".



View of the assembly of the adapter plates on rotor and basic carrier

Item	Description	ERS 135	ERS 170	ERS 210
1	Mounting screws	M8	M10	M10
2	Centering pin	D8/H7	D10/H7	D10/H7
3	Centering pins	D5/H7	D5/H7	D5/H7
4	Mounting screws	M8	M10	M12

Tightening torques for screws

Screws	M8	M10	M12
Tightening torques	24 Nm	48 Nm	84 Nm

8.2 Electrical connection

DANGER

Risk of fatal injuries due to electric shock!

- Switch off power supply before assembly, setting and maintenance and make sure that it cannot be accidentally switched back on again.
- Arbeiten an elektrischen Anlagen nur von Elektrofachkräften durchführen lassen.
- Disconnect the controller from the power supply. The intermediate circuit capacitors must be discharged (wait about 5 minutes until the capacitors have discharged).
- Observe the sequence when connecting the cables (grounding cable first, then conductors).

NOTE

Cables are electronic components which can react sensitively to high-frequency interference or electromagnetic fields.

- Check that the cable is correctly connected and installed.
- There must be a sufficient distance between sources of interference and their supply cable.

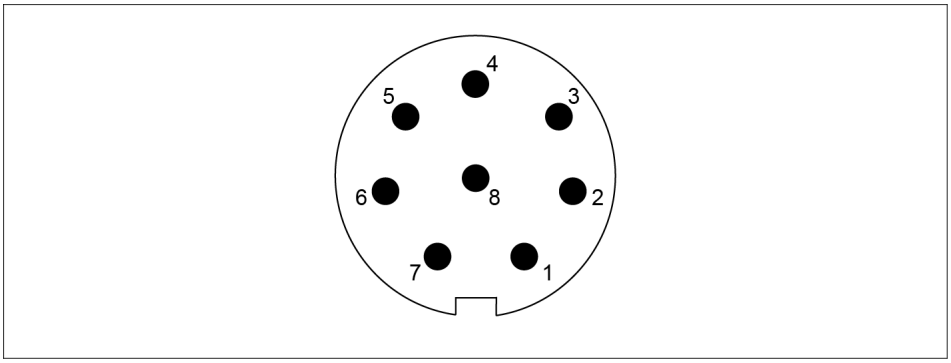
Preconditions for installing the connection cables:

- The cables are without tensile and torsion loads. Use cable guide chains.
- The minimum bending radius (7.5 times the cable diameter) is complied with, (☞ 6.2, Page 29).
- The motor's range of rotation and function are not impaired.

NOTE

For more information about the converter parameters, refer to the user manual for the converter.

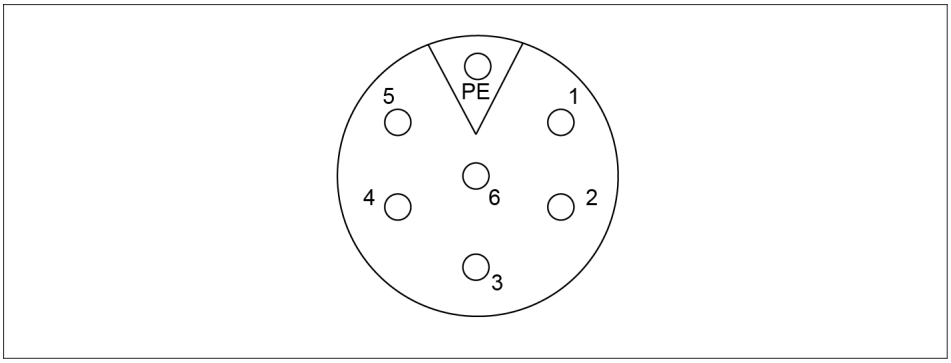
Sensor plug connection assignment



Sensor plug

Pin	Signal	Pin	Signal
1	A (SIN +)	5	Z (Ref +)
2	/A (SIN -)	6	/Z (Ref -)
3	B (COS +)	7	GND
4	/B (COS -)	8	Vcc

Connection pin assignment power plug



power plug

Pin	Signal	Pin	Signal
PE	ground/Mengine case	4	N. C.
1	U	5	Temperature sensor 1
2	V	6	Temperature sensor 2
3	W		

The ERS is supplied with prefabricated cables in lengths of 5 to 20 m which have to be ordered separately (red power cable, white sensor cable, Y-cable), (☞ 5, Page 19).

The ERS must be connected to a converter.

The cable colors and designations in the following tables apply to the SCHUNK connection cable.

Observe the cable assignment.

Connection assignment of the red power cable

Function	Signal	Cable designation
Power	U	Black A1 (U)
	V	Black A2 (V)
	W	Black A3 (W)
	PE	Green/Yellow
Temperature sensor	T1	Red
	T2	Blue

Connection assignment of the white signal cable for Bosch IndraDrive Basic/Advanced

Function	Signal	Pin assignment – 15-pin Sub-D socket
Encoder	/Z (Ref -)	Pin 3
	Z (Ref +)	Pin 4
	/B (COS -)	Pin 5
	B (COS +)	Pin 6
	A (SIN +)	Pin 7
	/A (SIN -)	Pin 8
	GND	Pin 10
	Vcc	Pin 12

Connection assignment of the white signal cable for Bosch IndraDrive CS

Function	Signal	Pin assignment – 15-pin Sub-D socket
Encoder	A (SIN +)	Pin 2
	/A (SIN -)	Pin 3
	GND	Pin 4
	B (COS +)	Pin 5
	/B (COS -)	Pin 6
	Z (Ref +)	Pin 9
	/Z (Ref -)	Pin 10
	Vcc	Pin 12

Connection assignment of the white signal cable for Siemens Sinamics

Function	Signal	Pin assignment – 15-pin Sub-D socket
Encoder	/B (COS -)	Pin 1
	Vcc	Pin 2
	Z (Ref +)	Pin 3
	/Z (Ref -)	Pin 4
	A (SIN +)	Pin 5
	/A (SIN -)	Pin 6
	B (COS +)	Pin 8
	GND	Pin 10

Connection assignment of the power cable for Sinamics (connection to converter)

Function	Signal	Pin allocation – Siemens circular plug
Power	U	U2
	V	V2
	W	W2
	PE	Earth

8.3 Optional holding brake

WARNING

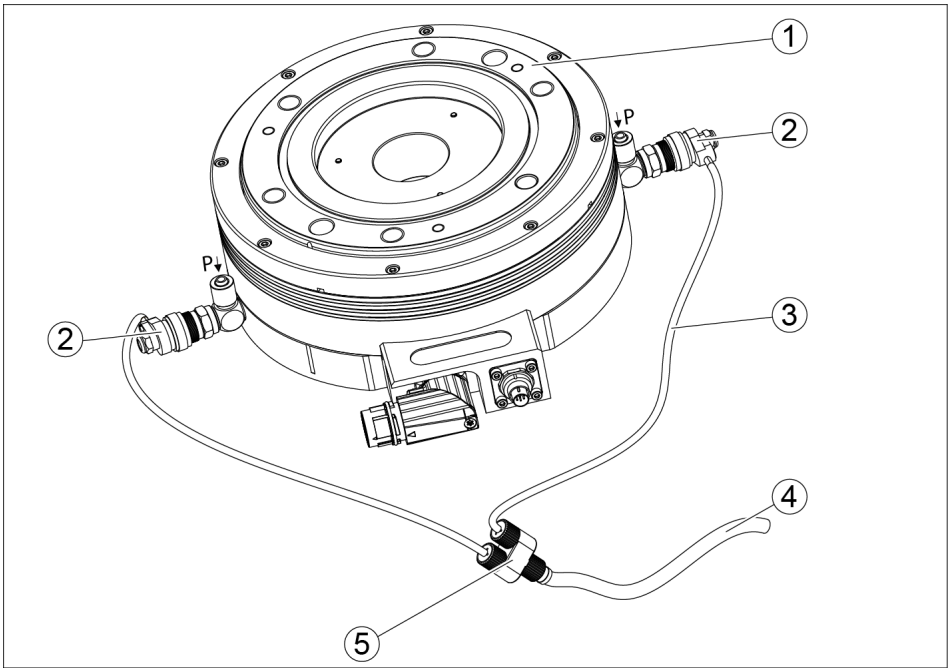
Risk of injury due to unexpected movement of the machine/automated system!

- The holding brake is not a service brake.
- The holding brake is not allowed to be used as a safety component.
- The holding brake only applies rated torque, and is used for holding position at standstill.

WARNING

Risk of injury when working on the micro valve!

- Switch off the energy supply.
- Switch off the compressed air supply.



Rotary module with micro valve

1	Rotary module	4	Y distributor
2	Micro valve	5	Cable extension
3	Connection cable		

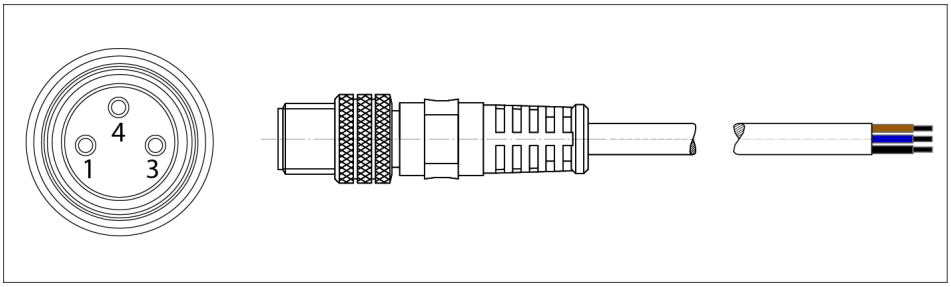
Comply with the following procedure when mounting the micro valve:

- If the micro valve is supplied as a complete component, dismantle the micro valve into its individual components and then install the individual components:
  - Dismantling the micro valve into its individual components, (☞ 8.3.2, Page 44).
  - Installing the individual components, (☞ 8.3.3, Page 45).
- If the micro valve is supplied in individual components, install the individual components, (☞ 8.3.3, Page 45).

8.3.1 Electrical connection

	NOTICE **Damage to the cable is possible.** The bending radius of the cable is not allowed to be less than the minimum amount: • **Static:** 10 times the cable diameter. • **Dynamic:** 15 times the cable diameter, suitable for cable tracks.

NOTE
Route and secure the connection cable so there are no tensile and twisting forces on the valve cover. Tensile and twisting forces can cause the screw cap to come loose and lead to contact problems.



PIN allocation M8 plug and cable color table extension

PIN	Cable color	Assignment
1	Brown	n.c.
3	Blue	GND
4	Black	Control voltage, +24 VDC

Screw cap with LED:
If the connection cable of the micro valve has been connected correctly to the electrical power supply, the LED in the screw cap will light up when the 24 VDC voltage is applied.

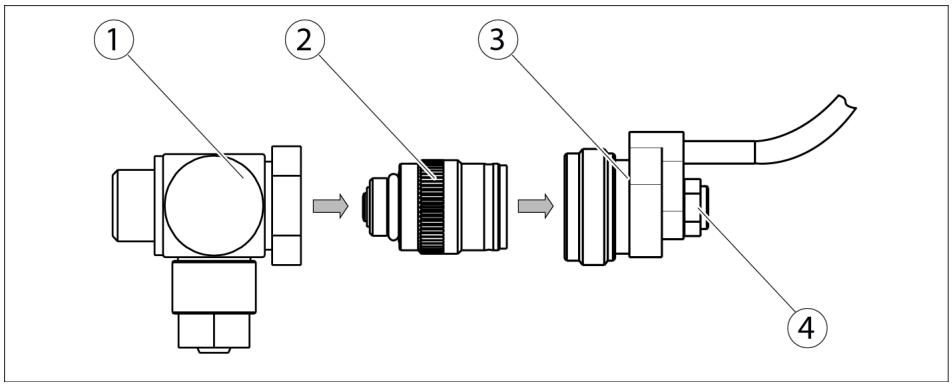
8.3.1.1 Connection to Siemens Safe Brake Relay

Terminal	Cable color	Assignment
BR+	Black	+24 VDC
BR-	Blue	GND

8.3.1.2 Connection to Bosch Rexroth IndraDrive

Terminal	Cable color	Assignment
X6-3	Black	+24 VDC
X6-4	Blue	GND

8.3.2 Dismantling micro valve



Dismantling micro valve

1 Undo the knurled screw on the valve cover (3).

NOTE

In valves with fixed covers, the valve cover with connection cable cannot be removed.

2 Remove the valve cover (3) with connection cable and sound absorber (4).

3 Unscrew the valve cartridge (2) from the swivel fitting (1).

8.3.3 Installing and connecting the micro valve

⚠ WARNING

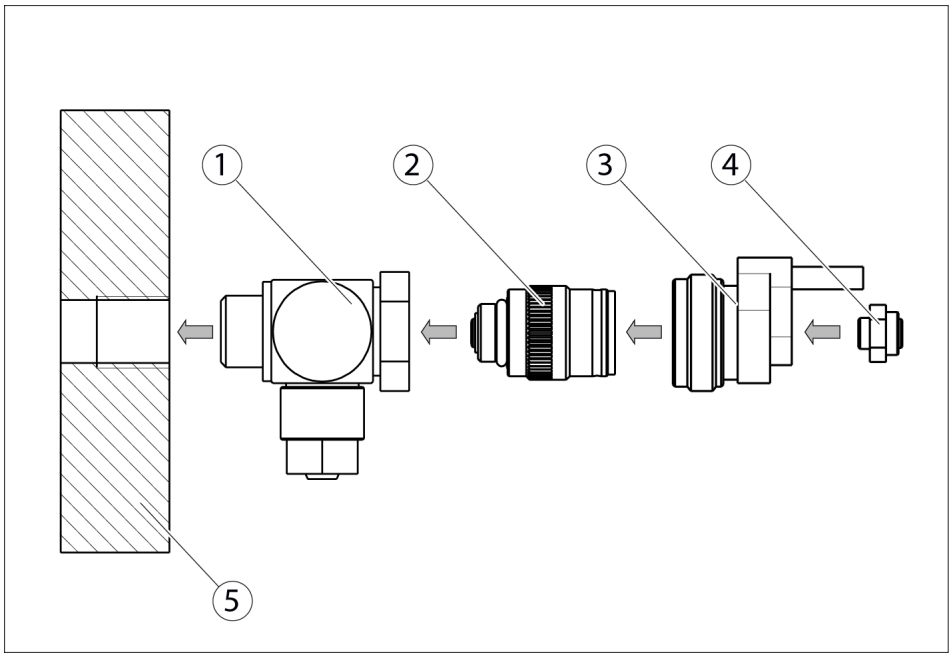
Risk of injury when working on the micro valve!

- Switch off the energy supply.
- Switch off the compressed air supply.

NOTICE

Damage to valve cartridges, valve cover and accessories!
Valve cartridge, valve cover and accessories can be damaged by using tools.

- Only install or remove the valve cartridge, valve cover and accessories by hand.



Micro valve

NOTE
Always install the micro valves in the following sequence, for example to avoid unscrewing the screw cap from the valve cartridge if an accessory is fitted subsequently.

1 Screw the hollow screw of the swivel fitting (1) **lightly** into the pneumatic unit (5), **without tightening**.

2 Turn the swivel fitting (1) to the desired position and hold it firmly.

3 Tighten the hollow screw of the swivel fitting (1) in this position **Maximum torque 1.5 Nm**.

4 Screw the valve cartridge (2) into the swivel fitting (1) as far as possible
Maximum torque 3 Nm.

5 Screw the sound absorber (4) into the valve cover (3)
Maximum torque 3 Nm.

6 Put the valve cover (3) on the cartridge (2) with the connection cable in the required position.

7 Push the valve cover (3) onto the cartridge (2) and screw tight with the knurled nut onto the cartridge (2)
Maximum torque 3 Nm.

8 Connect the pneumatic hose to the pneumatic connection of the swivel fitting (1).

9 Push the Y-distributor onto the M8 plug of the connection cable and screw tight.

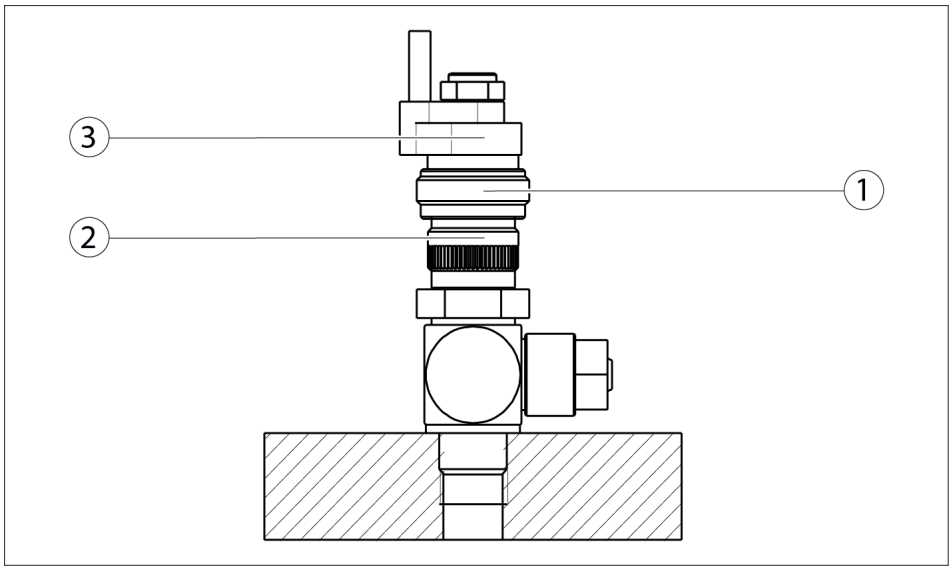
10 Push the cable extension onto the Y-distributor and screw tight.

11 Connect the cable extension to the electrical power supply, (☞ 8.3.1, Page 43).

12 Route the connection cable and cable extension and secure.

8.3.4 Realigning the connection cable

	NOTICE
	Risk of damage to the contacts! The contacts can be damaged if the valve cover is screwed on firmly and the alignment of the connection cable changed. • Define the position of the connection cable when the valve cover is put on.



Valve cover

Carry out the following steps if the position of the connection cable should be changed:

1 Unscrew the knurled nut (1) of the valve cover (3) from the valve cartridge (2).

2 Remove the valve cover (3) from the valve cartridge (2).

3 Put on the valve cover (3) again with the connection cable in the required alignment and hold it in position.

4 Tighten the valve cover (3) on the valve cartridge (2) with the knurled nut (1).

9 Start-up

NOTICE

Malfunction in the event of an overload!

- Avoid impact loads.
- Do not exceed the bearing load limits.

NOTICE

Malfunction in the event of overheating!

- Observe the motor’s technical data. (☞ 6, Page 20).

⚠ WARNING

Risk of injury and material damage when the machine/system moves unexpectedly!

- Only allow configuration work to be carried out by authorized specialist personnel.
- Observe the information in the operating manual for the controller.

⚠ WARNING

Collisions in setup mode when the machine/system moves unexpectedly!

The motor can run away.

- Keep the motor's moving range (360°) free.

9.1 Start-up of the Bosch Rexroth IndraDrive C/CS

NOTE

The brief instruction in this chapter is solely relevant for the simple start-up of the rotary module ERS with Bosch Rexroth IndraDrive. The user manual of the converter takes precedence.

The following description applies to firmware version MPH-05V12-D5.

Connection of the converter to the ERS

✓ **Read through the user manual of the converter before starting up the converter.**

1 Connect the converter to the three-phase system.

2 Connect the red power cable and the white sensor cable to the ERS.

3 Connect the 15-pin D-Sub plug of the sensor cable to the converter.

4 Connect the open ends of the power cable (U, V, W and Earth) to the converter.

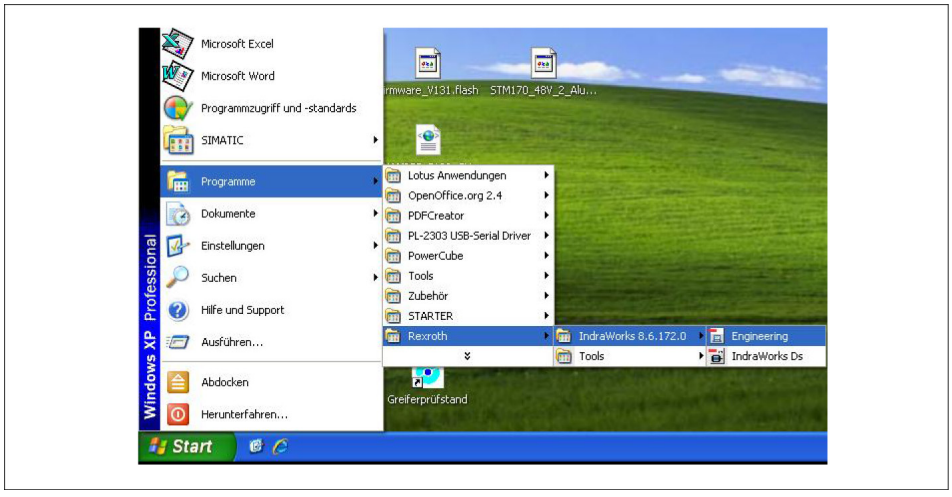
Setting up the converter

NOTE

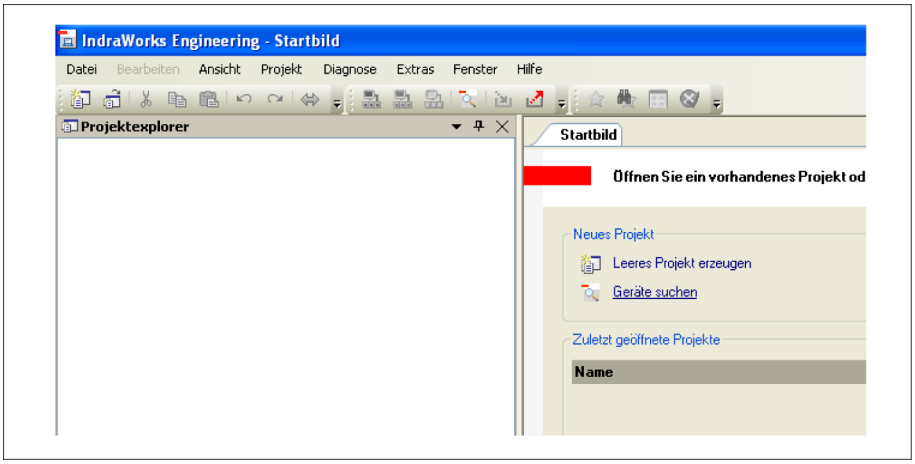
Select the corresponding interface for start-up via Ethernet. The procedure is the same.

1 Connect the RS232 interface of the computer to the serial interface of the converter using the serial cable.

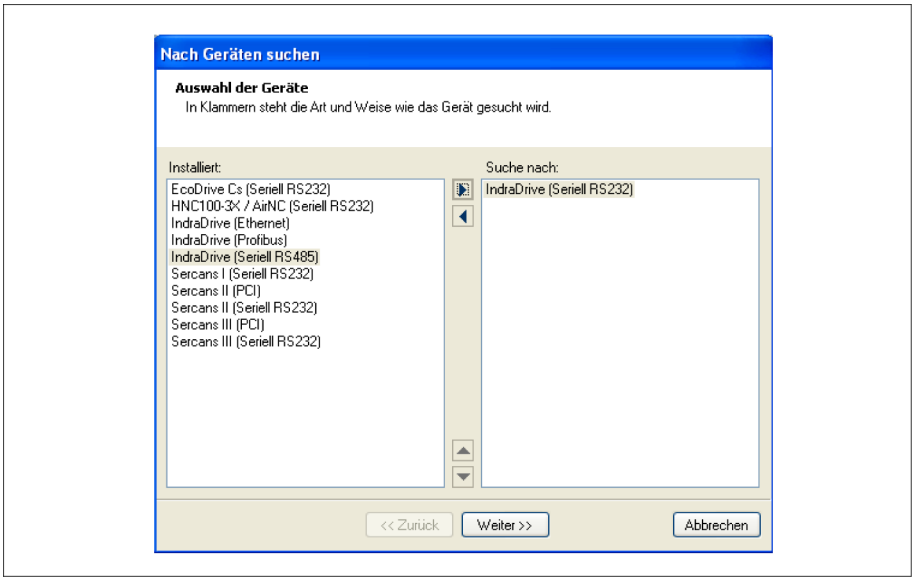
2 Switch on the converter and power unit.



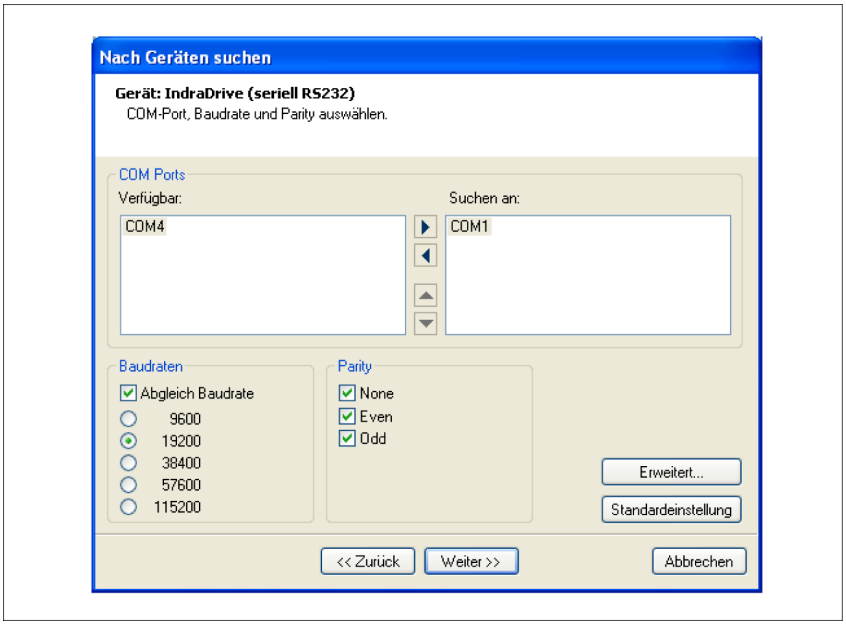
3 Start IndraWorks on the PC.



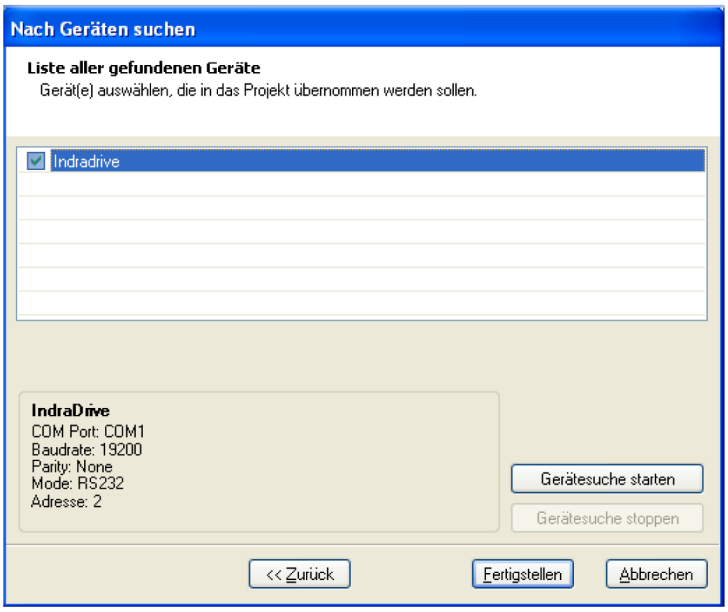
4 Search for a new device.



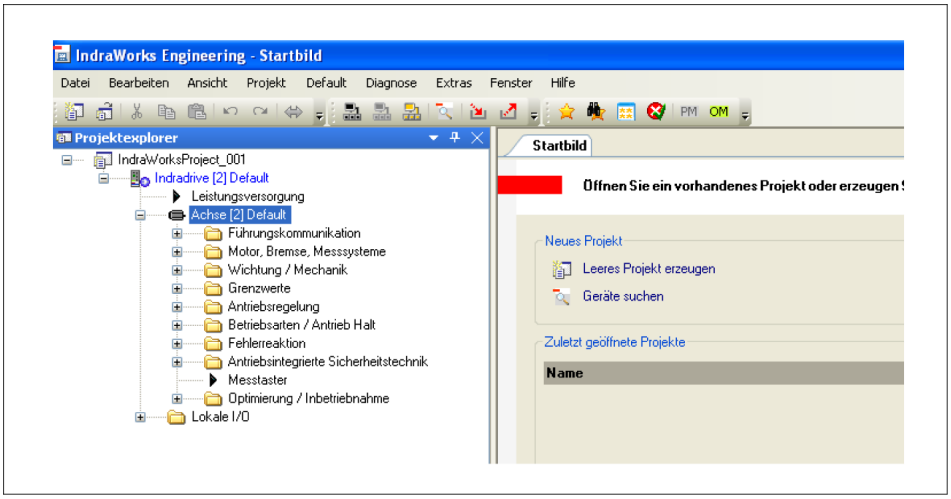
5 Select the interface on the converter.



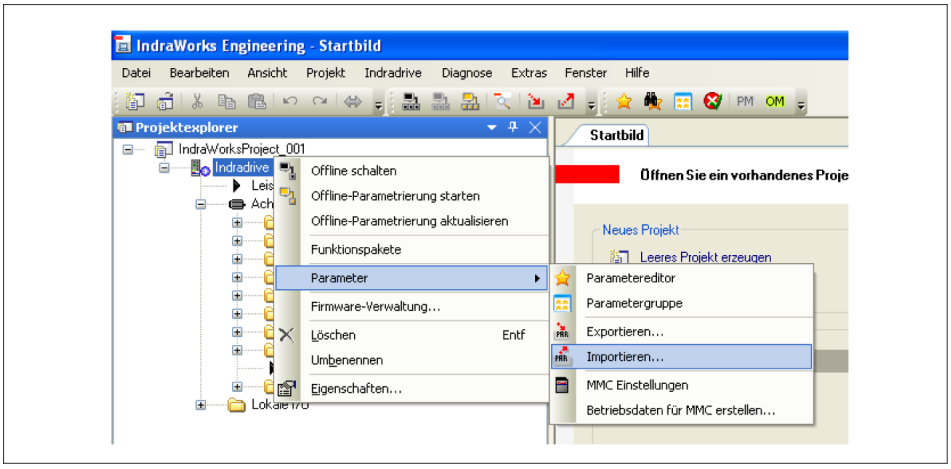
6 Select the interface on the computer.



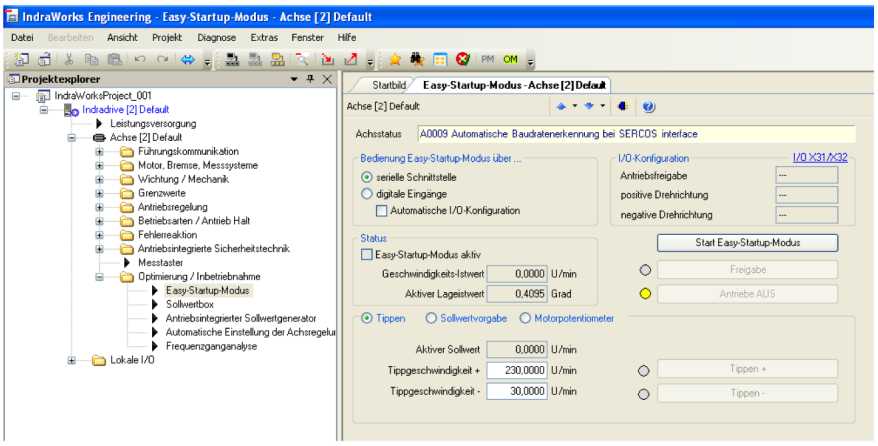
7 When the desired device has been found, click on "Finish".



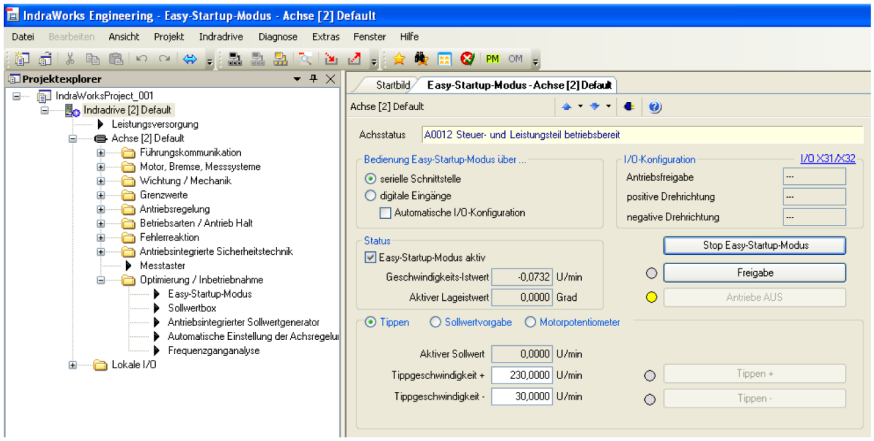
⇨ A new project is created automatically in the project explorer.



8 Import the parameter file supplied on the SCHUNK CD.



9 Open and start the Easy Start Up mode.



10 Enable the drive (ERS) (this is only possible when the power unit is switched on).

Gefahrbringende Bewegungen!
WARNUNG !
Gefahrbringende Bewegungen!
Lebensgefahr, schwere Körperverletzung oder Sachschaden.
Vor Inbetriebnahme:
- Not-Stop-Schalter leicht zugänglich in unmittelbarer Nähe anordnen.
- Die Funktion der Not-Aus-Einrichtung prüfen.
Mit OK bestätige ich, dass ich die unten stehenden Sicherheitshinweise sorgfältig gelesen habe und gebe Reglerfreigabe für die ausgewählte Achse.
Maßnahmen:
- Not-Stop-Schalter leicht zugänglich in unmittelbarer Nähe anordnen.
Die Funktion der Not-Aus-Einrichtung vor der Inbetriebnahme prüfen.
- Vor dem Zugriff oder Zutritt in den Gefahrenbereich die Antriebe sicher zum Stillstand
bringen und gegen unbeabsichtigten Anlauf sichern, zum Beispiel durch Freischalten des
OK
Abbruch
Hilfe

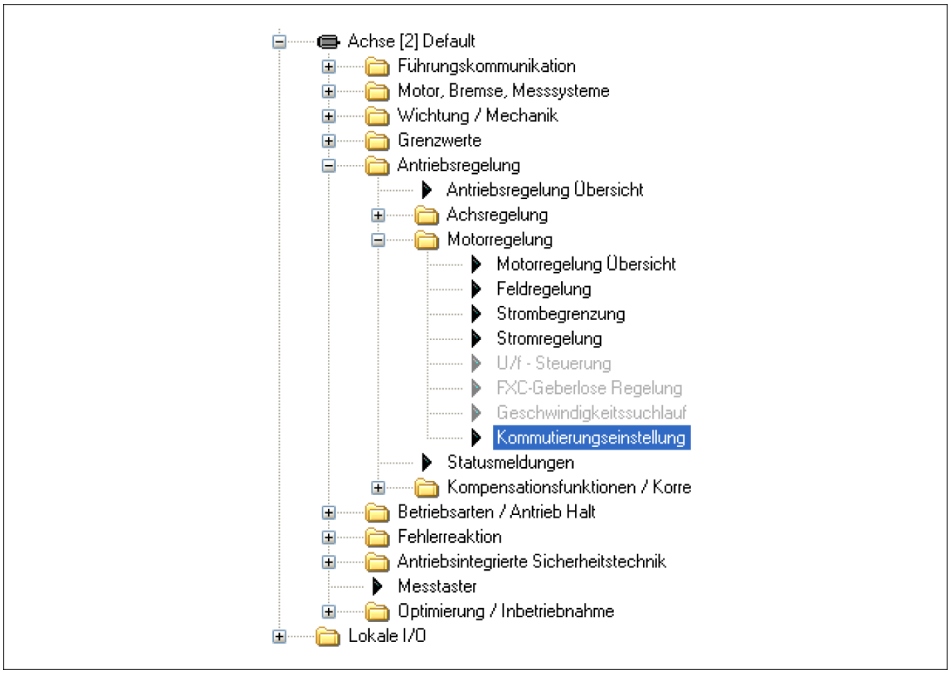
11 Read the warning attentively and acknowledge it by clicking "OK".

NOTE

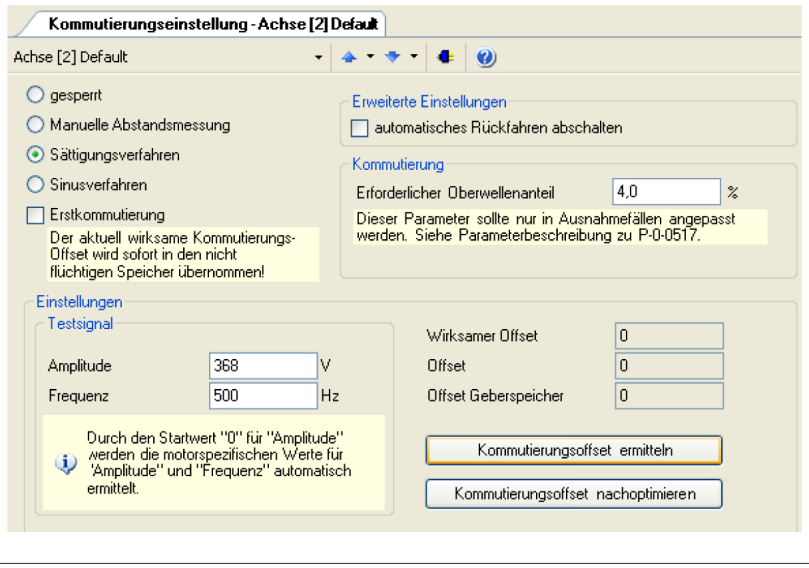
In the case of the Bosch Rexroth IndraDrive C/CS converter, it can occur that the commutation current is too low or too high following the enable.

If one of these errors occurs:

- delete error.



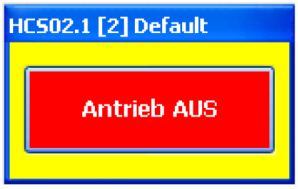
12 Then go to the following location: "Drive control" → "Motor control" → "Commutation settings".



13 Establish the new commutation offset.

NOTE

When the drive is enabled, a field appears in the foreground of the screen that can be used to switch off the drive (ERS) in an emergency:



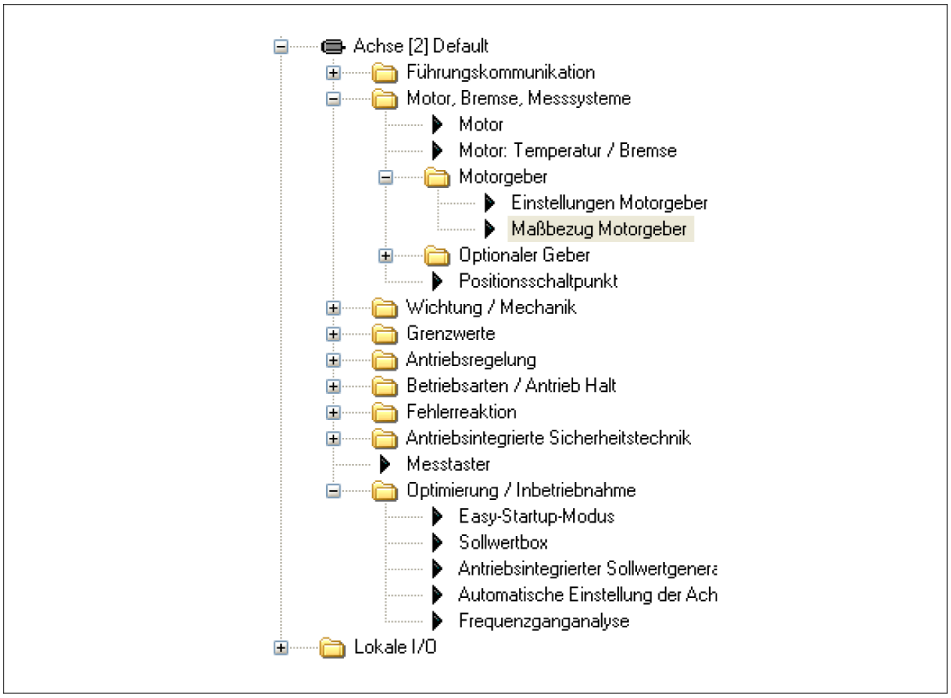
14 Choose between the various options:

⇨ Referencing

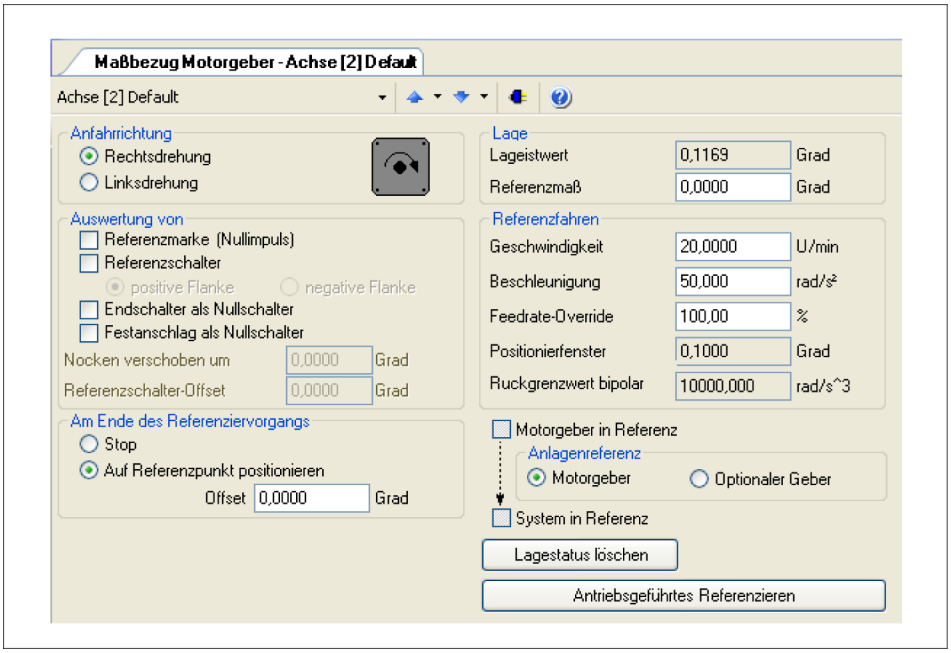
⇨ Velocity run

⇨ Positioning run

Referencing

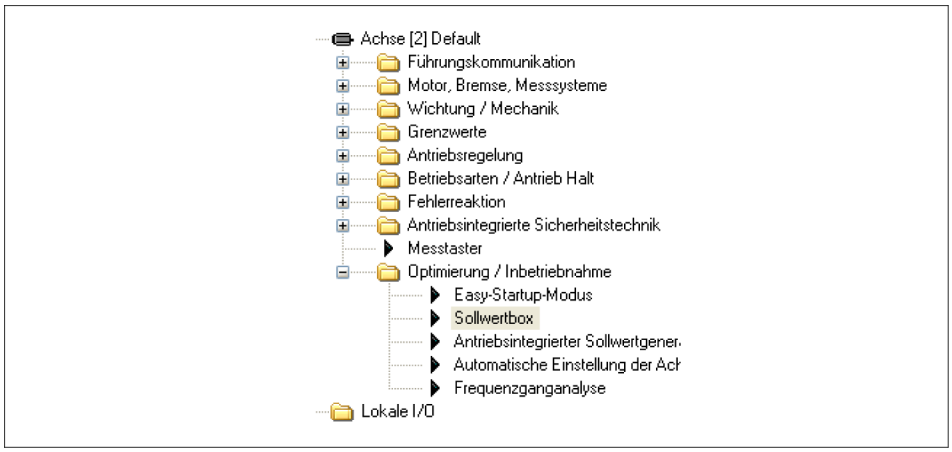


1 Go to the following location: "Motor" → "Motor encoder" → "Motor encoder dimensional reference".

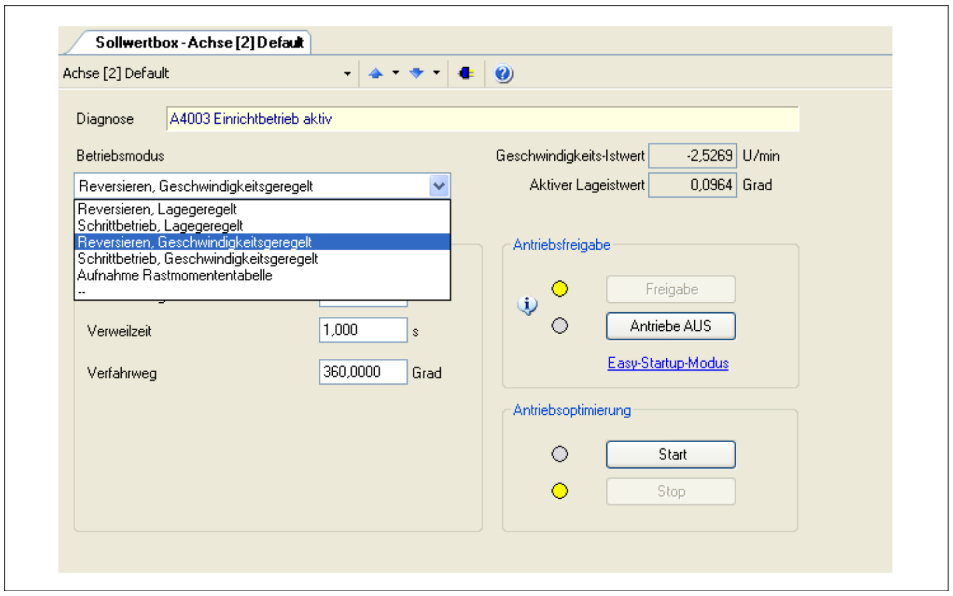


2 Select the referencing type. Select the "Drive-guided referencing" field to start the reference movement.

Velocity run

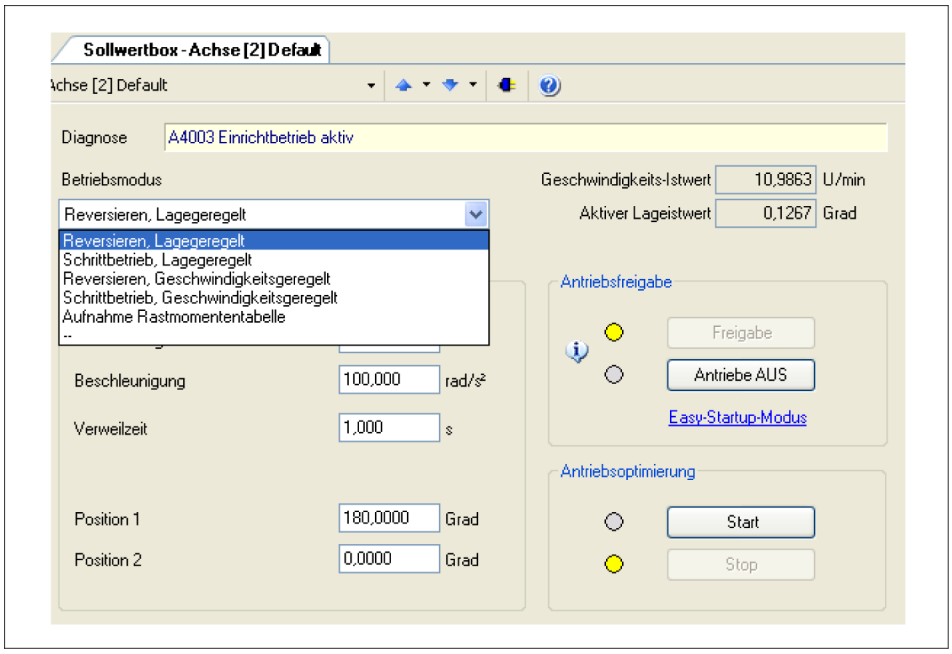


1 Select the "Reference value box" under the "Optimization/Start-up" folder.



2 Select the velocity movement type under "Operating mode". To start the movement, click on "Start".

Positioning run



1 Select a "position-controlled" positioning movement under "Operating mode".

NOTE

With respect to the use of other functions:
Bosch Rexroth IndraDrive C user manual or support from Bosch Rexroth.

9.2 Start-up of the Siemens Sinamics S120 CU310/CU320

NOTE
The brief instruction in this chapter is solely relevant for the simple start-up of the ERS with Siemens Sinamics S120 CU310/CU320. The user manual of the converter takes precedence.

NOTICE

Failure of or irreparable damage to the drive if the following parameters are not configured correctly!

- **p 340** Automatic calculation of motor/control parameters – **[3]**
- **p 383** Motor limit current
  ERS135: 3.8A
  ERS170: 5.98A
  ERS210: 5.7A
- **p604** Motor overtemperature warning threshold – **95°C**
- **p605** Motor overtemperature fault threshold – **105°C**
- **p606** Motor overtemperature time stage – **0.1s**
- **p611** I2T time constant thermal – **30s**
- **p612** Thermal motor model configuration – **1H**
- **p615** I2T motor model fault threshold – **90°C**
- **p616** Motor overtemperature warning threshold 1 – **100°C**

NOTE

- Only the values of the following parameter files are allowed to be used for start-up of the individual sizes:
  Without DDF:
  - **ERS135:** 5522559_ERS135_CU310_320_FW4
  - **ERS170:** 5522560_ERS170_CU310_320_FW4
  - **ERS210:** 5522561_ERS210_CU310_320_FW4
  With DDF:
  - **ERS170:** 5523138_ERS170_DDF_CU3xx_FW4
  - **ERS210:** 5523139_ERS210_DDF_CU3xx_FW4
- The parameters can either be loaded into the inverter as described in this chapter or entered manually using the start-up wizard.

	NOTICE
	If different parameters are used or the parameters are calculated automatically, the drive could suffer irreparable damage! • With manual input, it is necessary to make sure that only the values from the parameter files specified above are used.

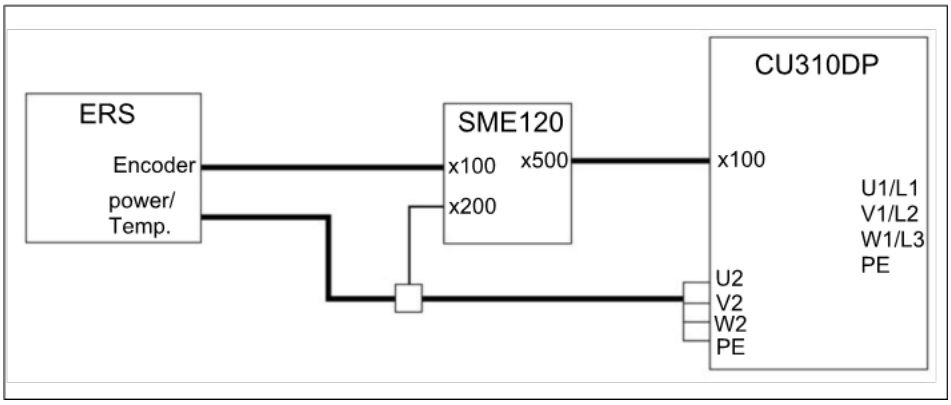
The following description applies to the drive ES - starter version V4.2.0.1.

NOTE
With the Siemens Sinamics, it is possible to change the voltage supply on the encoder interface from 5 V to 24 V using a parameter.

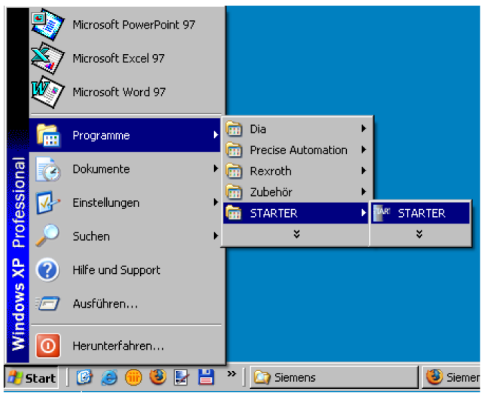
- Ensure that the voltage supply on the encoder interface is set to 5 V.

Establishing the connection

✓ **Read through the user manual of the converter before starting up the converter.**

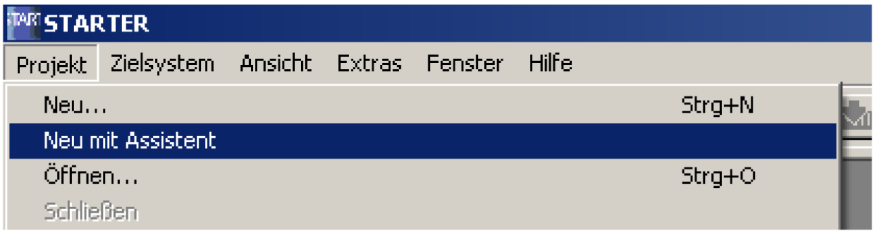


1 Connect the motor with the converter:
2 Connect the PC to the converter via a Profibus adapter.
3 Switch on the converter and power unit.

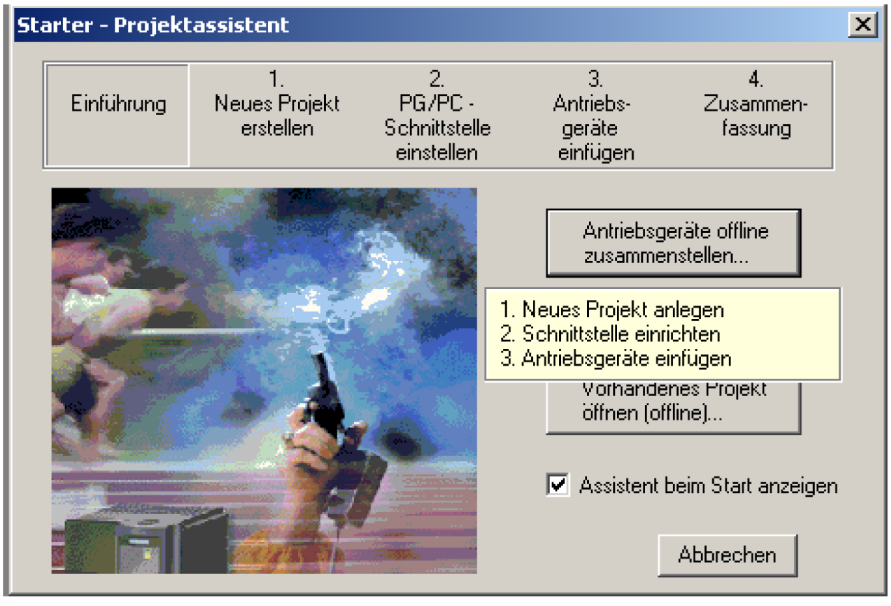


4 Initiate the Siemens Starter software.

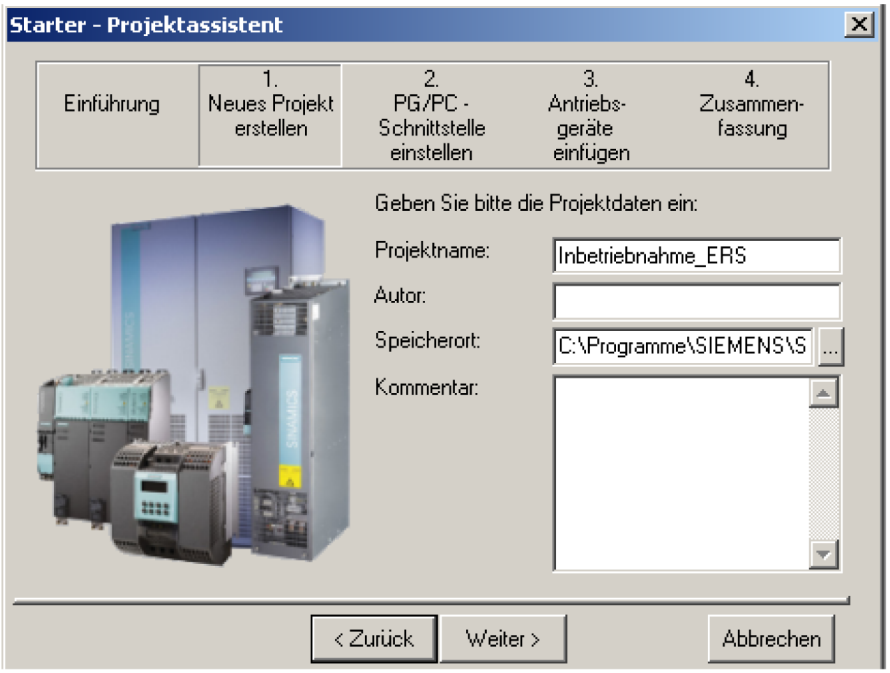
Creating a new project



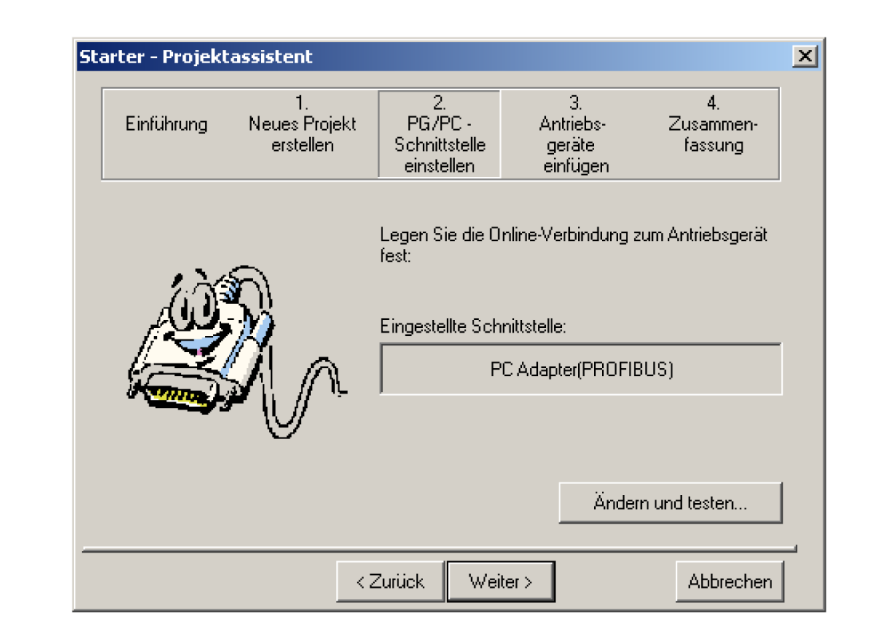
1 Start a new project using the wizard.



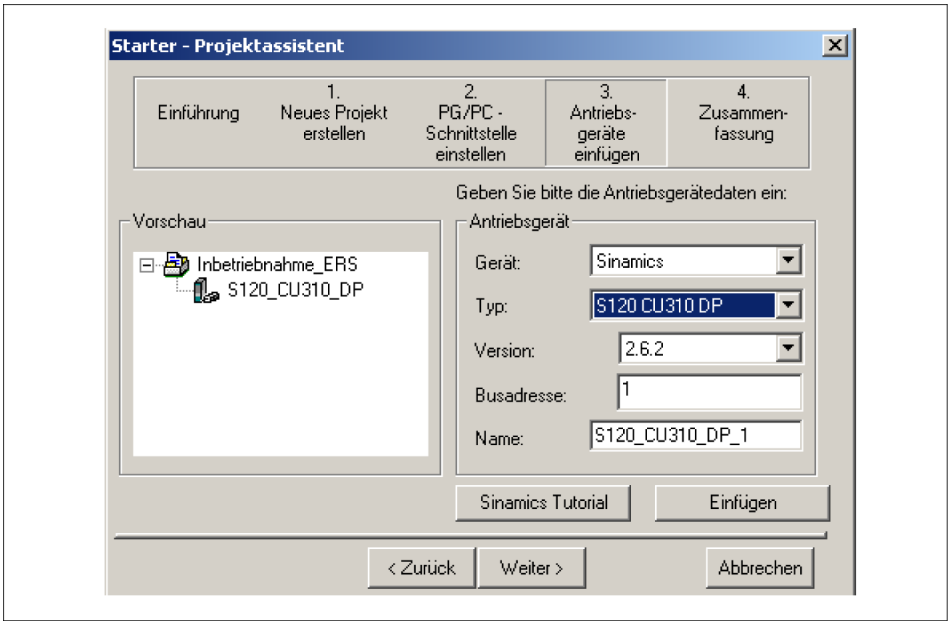
2 Assemble the drive control unit offline.



2 Assign the project a name, e.g. "Start-up".



⇨ The PG/PC interface has already been set to the Profibus adapter.

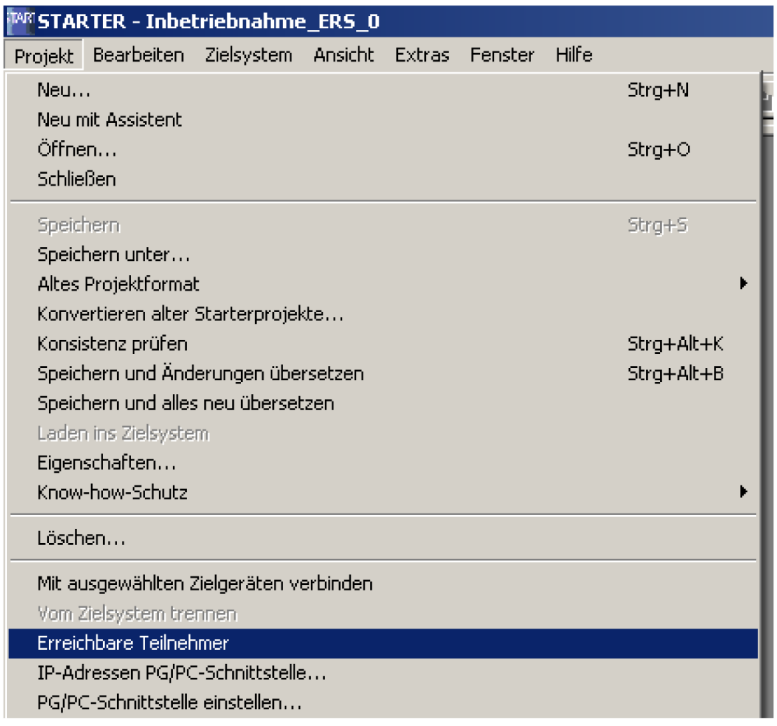


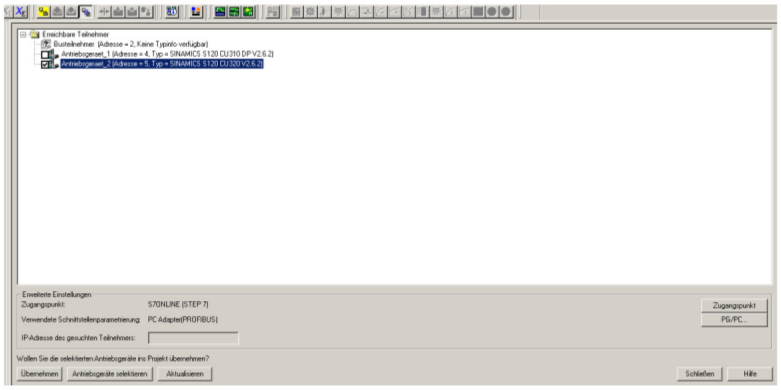
4 Select and integrate the drive unit. The bus address is dependent on the converter.

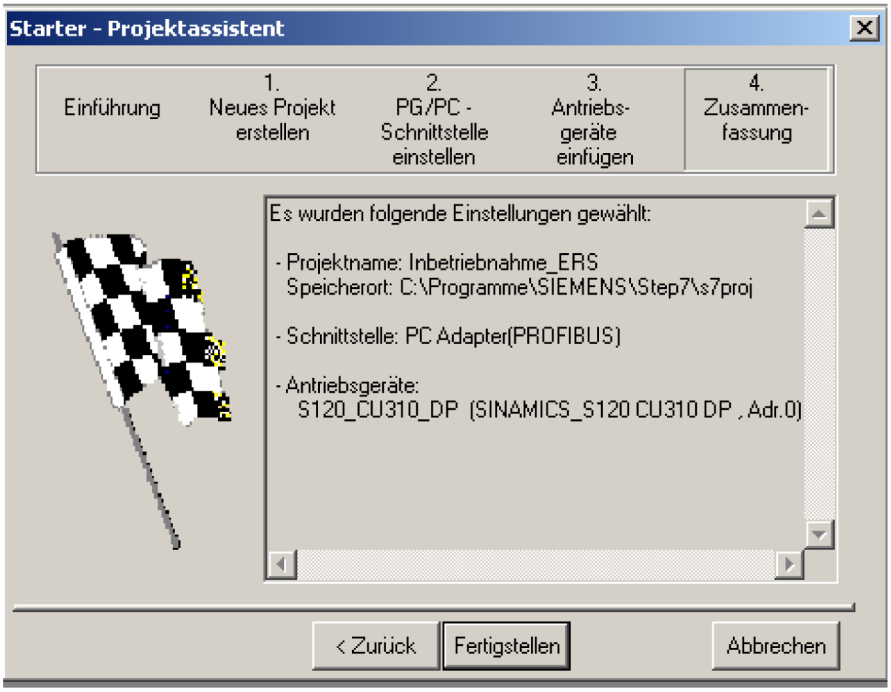
NOTE

The following function can only be performed after an offline project has been created (see step 2).

Alternatively, the "Reachable participants" function can be used for adding the drive unit automatically.

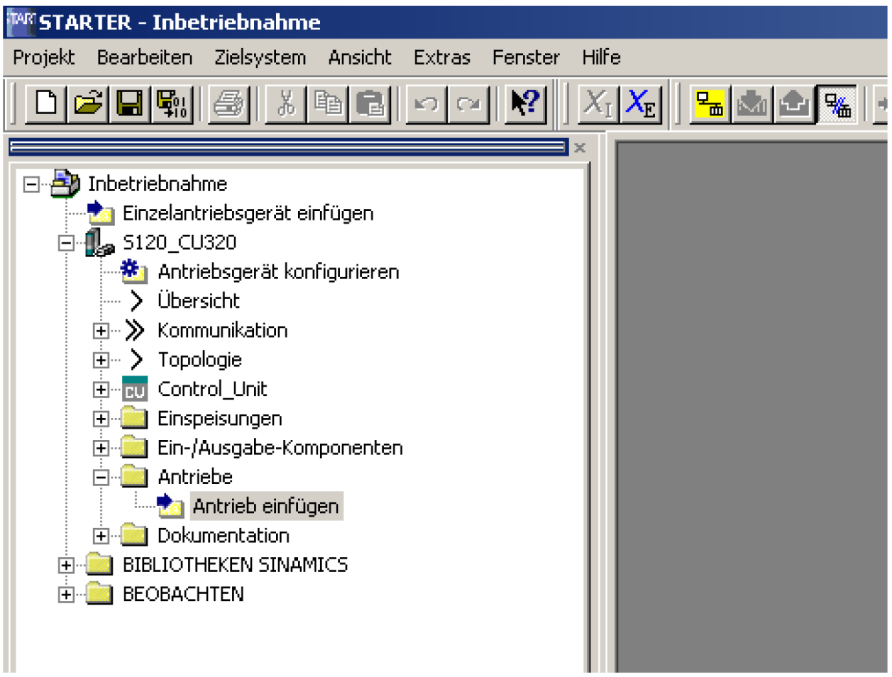




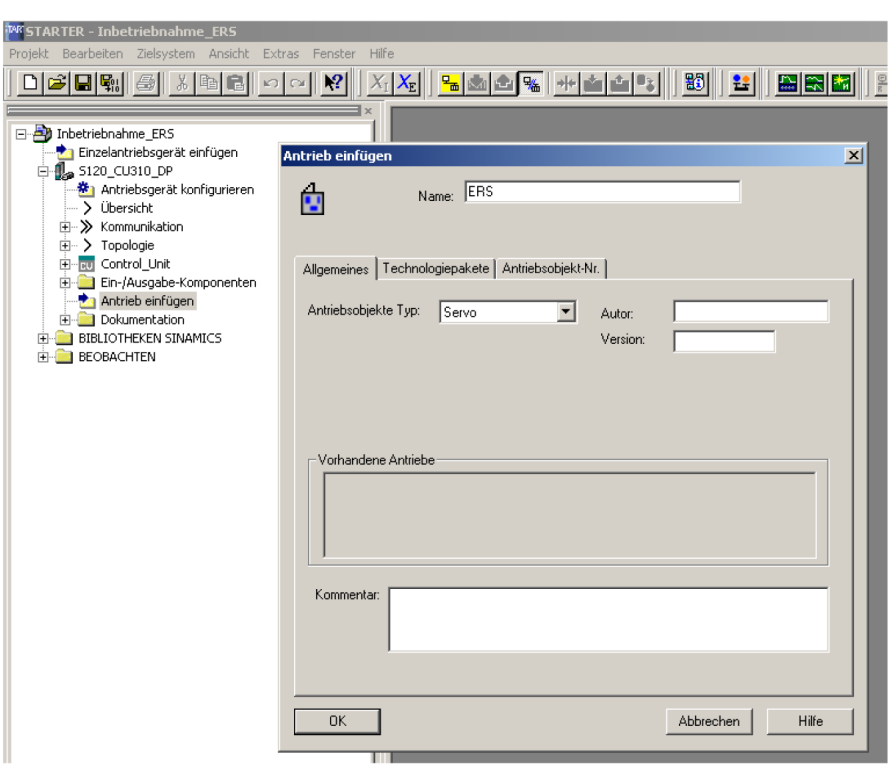


5 Finish project.

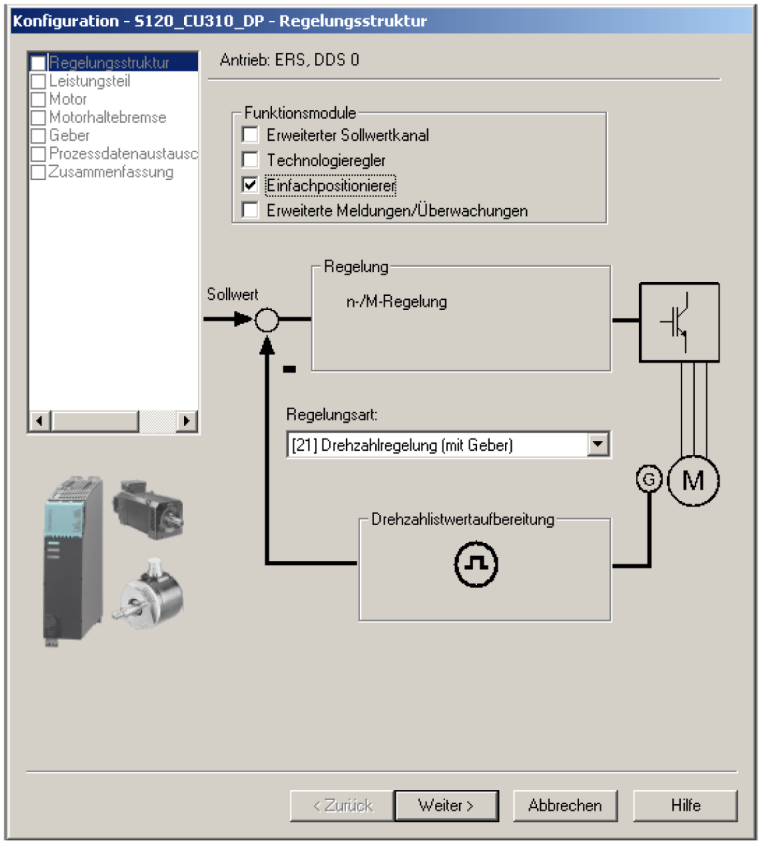
Parameterizing the drive



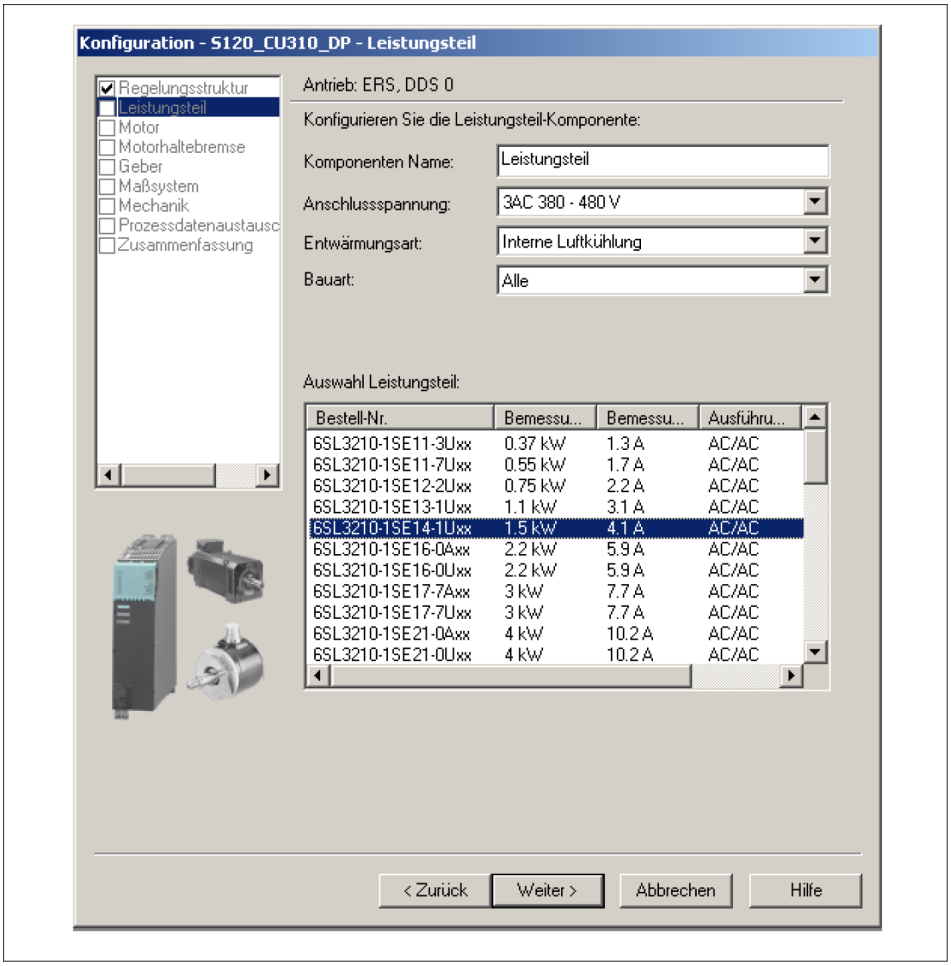
1 Integrate the drive unit (double click on "Integrate drive unit").



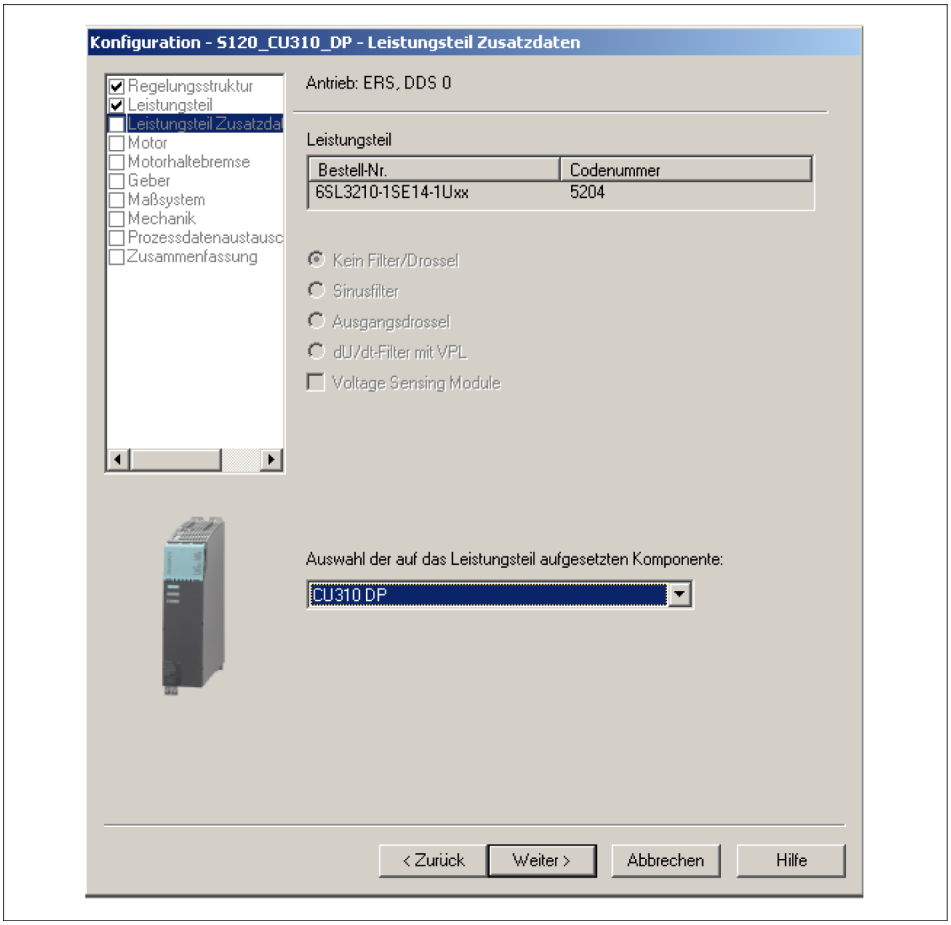
2 Name the drive (e.g. ERS).



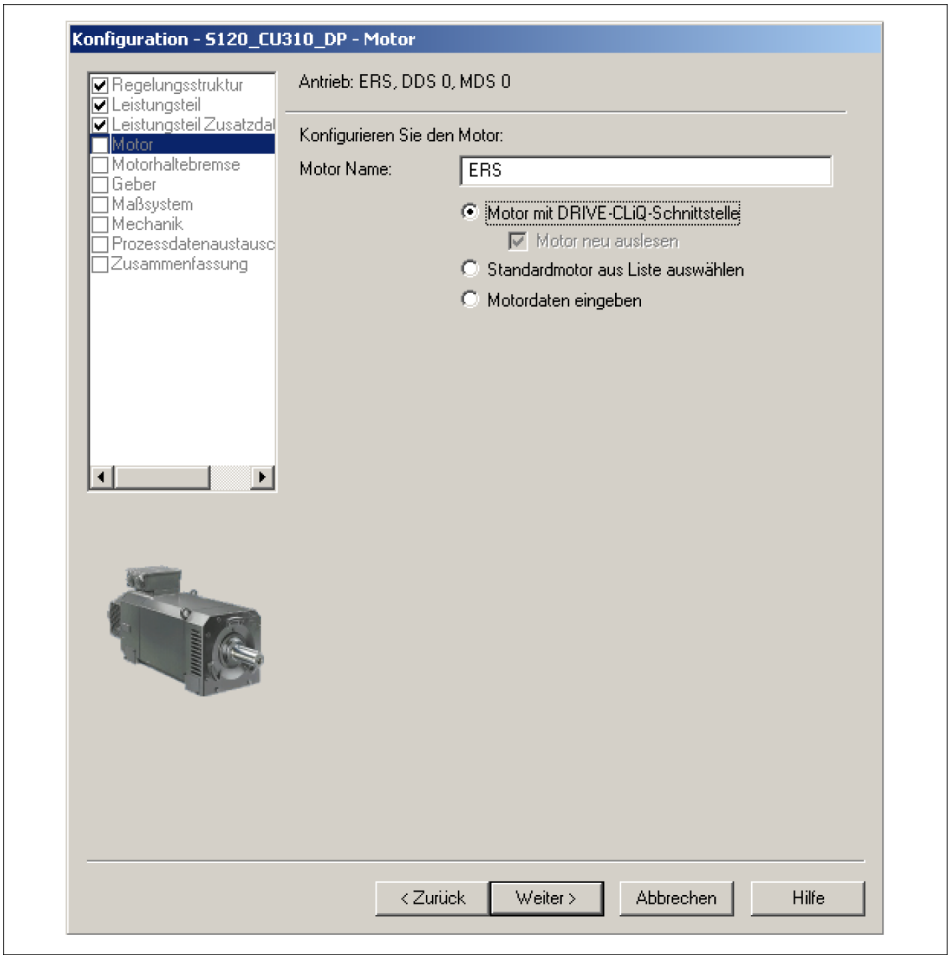
3 Select the control mode (simple positioner and speed control with encoder).



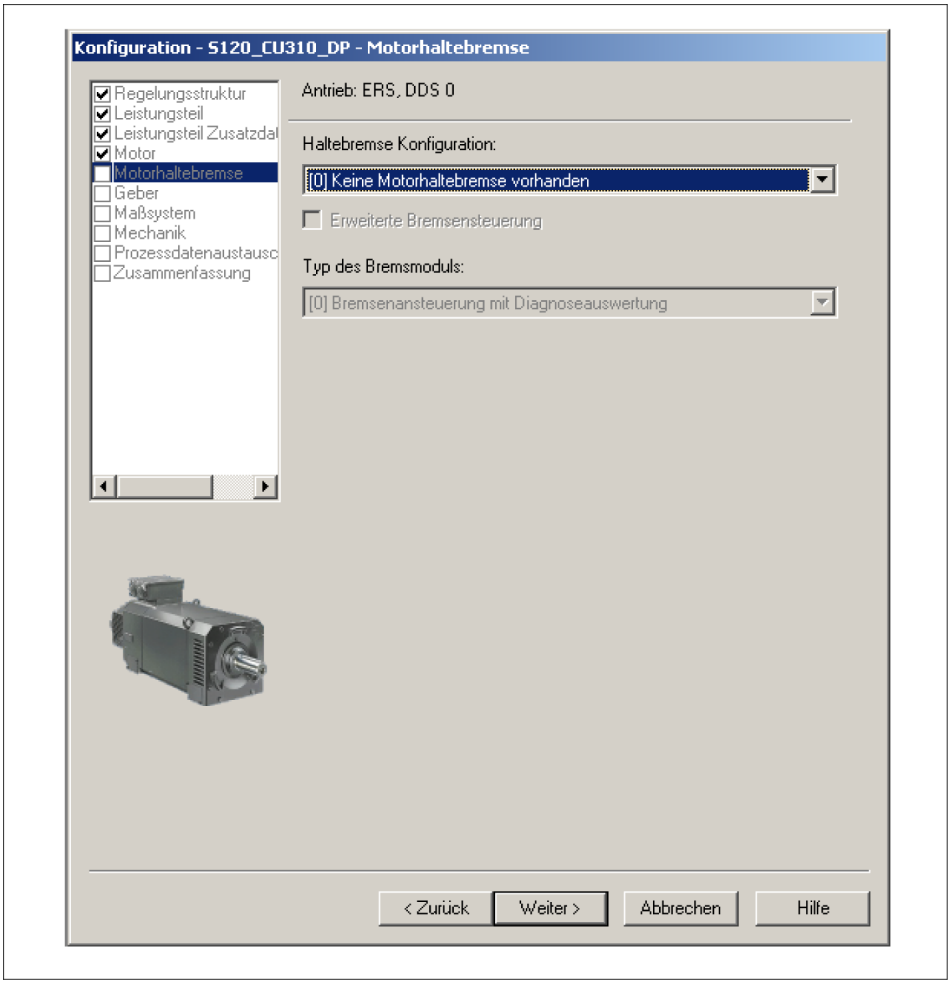
4 Select the power unit.



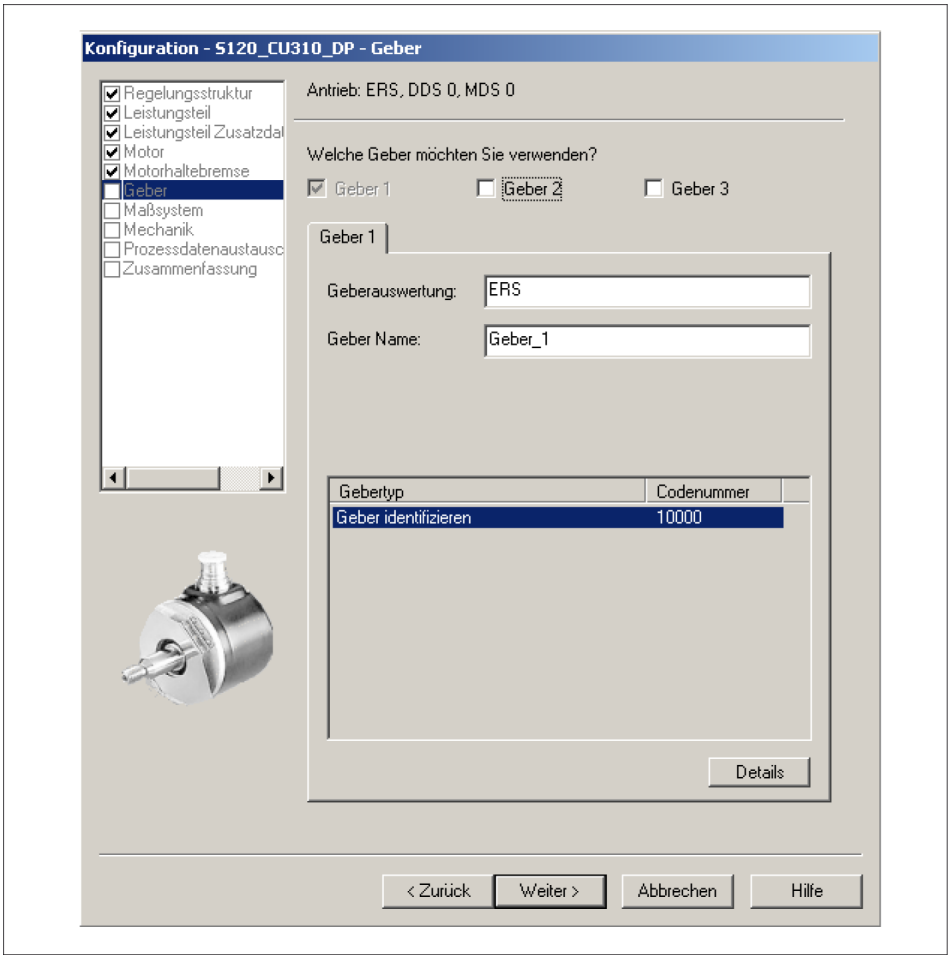
5 Select the control unit.



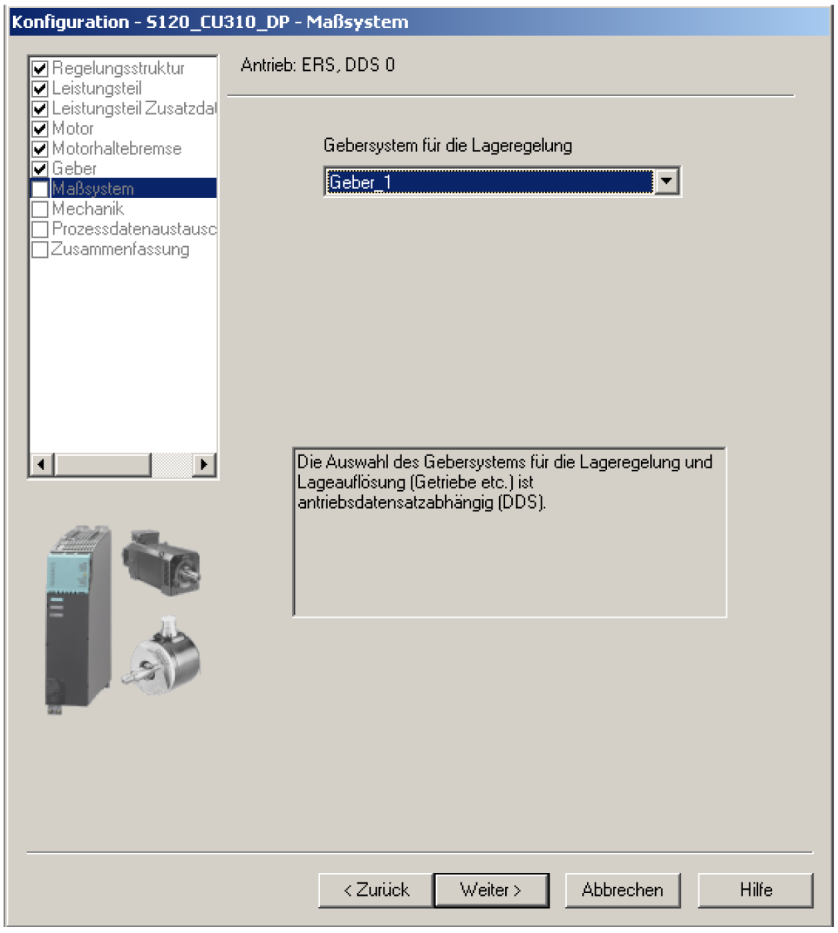
6 Enter the motor name, e.g. ERS and select the DRIVE-CLiQ interface.



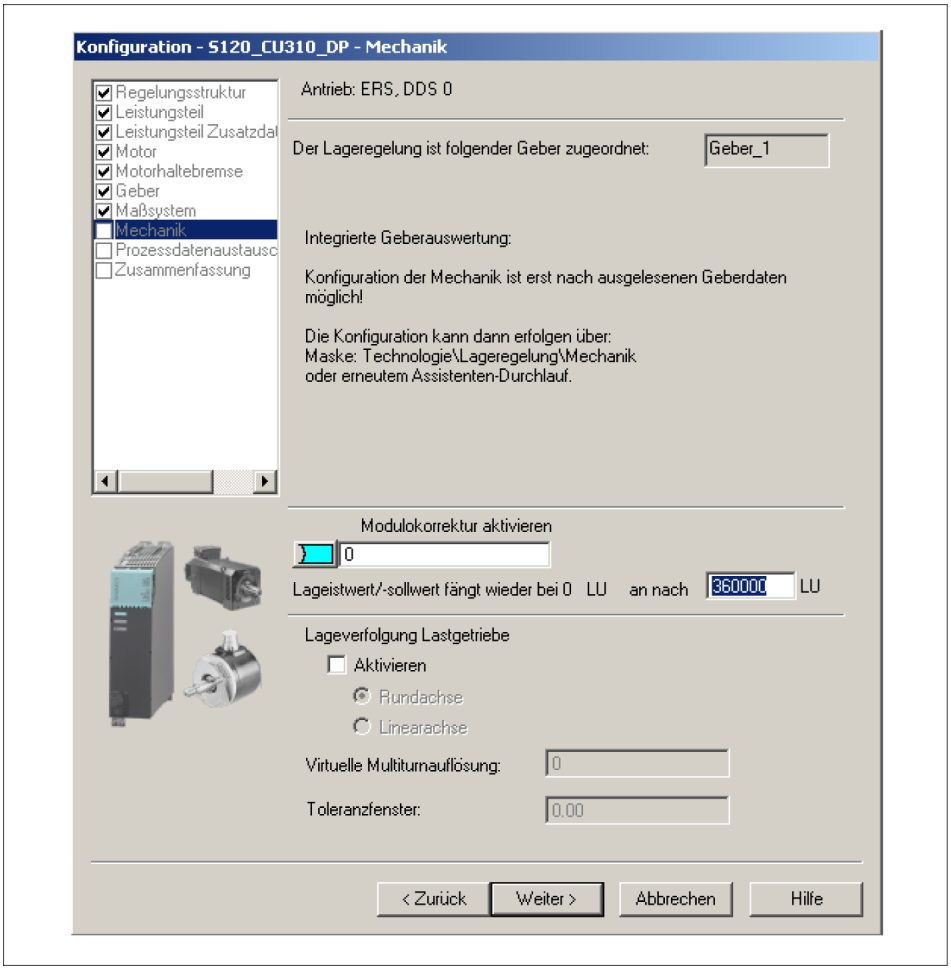
7 Configure the brake.
E.g. Set "No motor holding brake present".



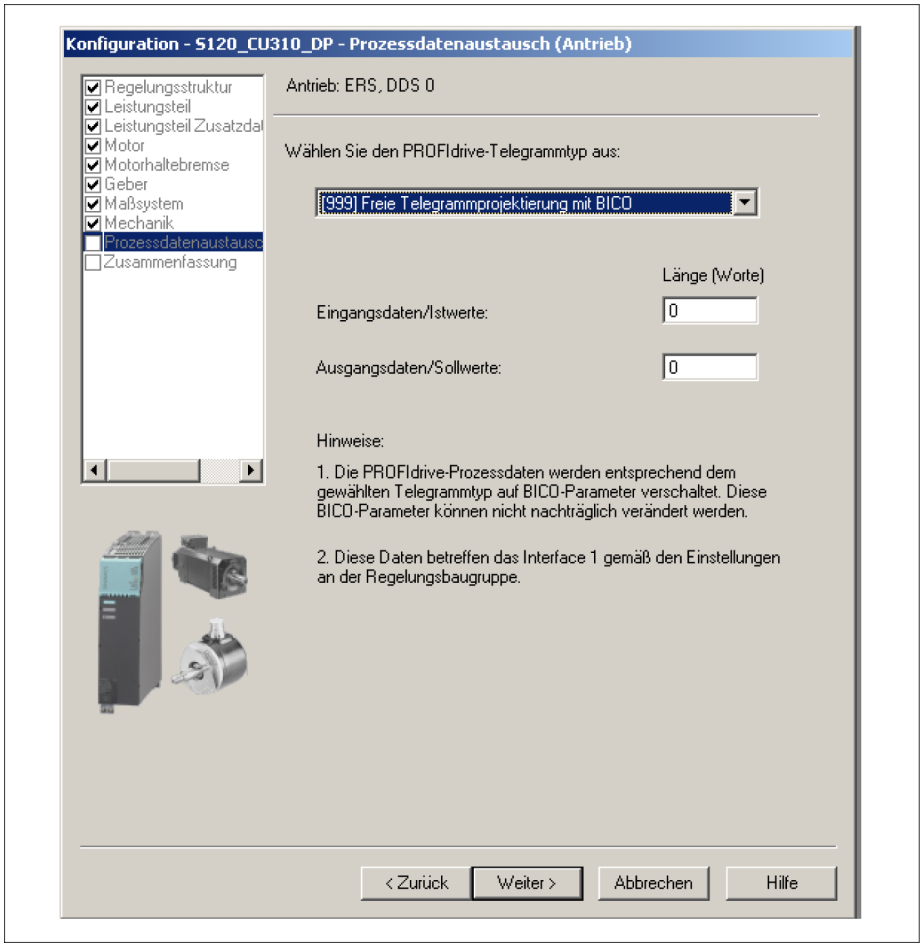
8 Encoder 1 is preset: "Next" without change.



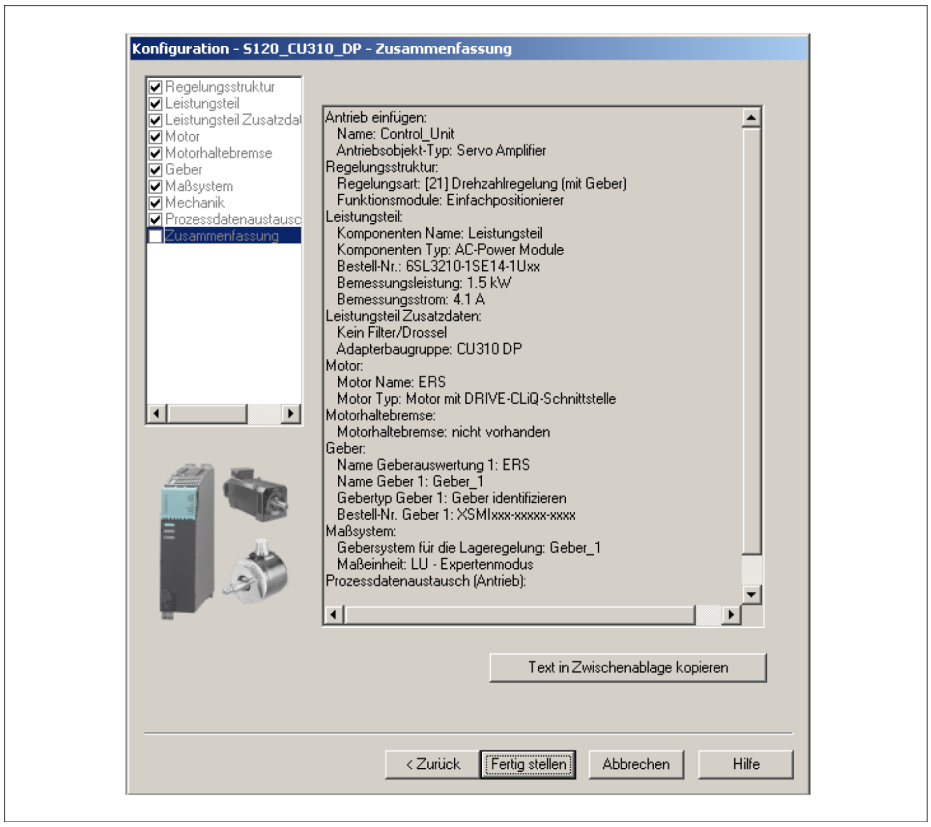
9 Configuration of system of dimensions: "Next" without change.



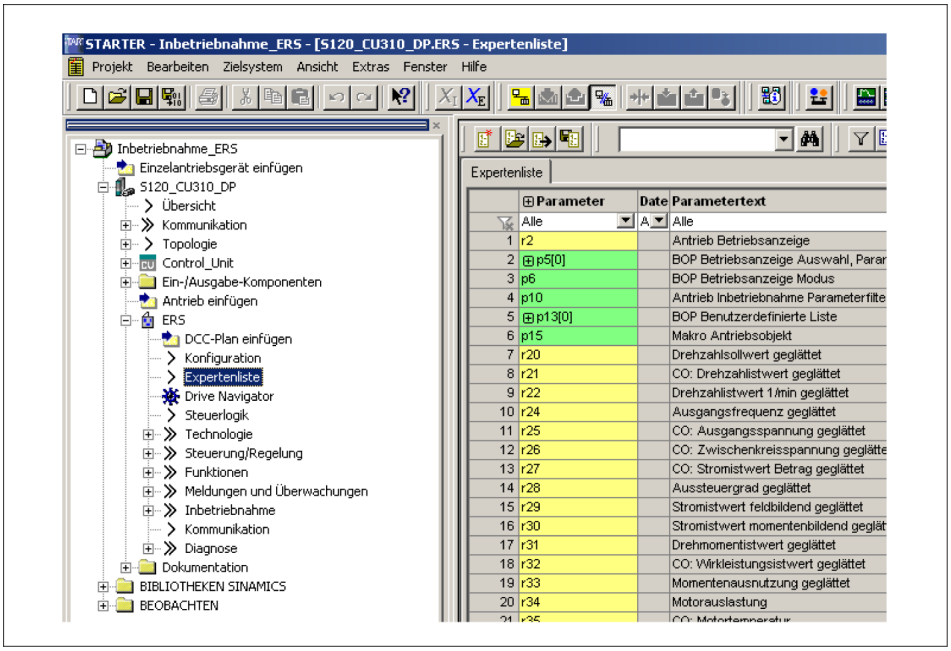
10 Configuring the mechanism: "Next" without change.



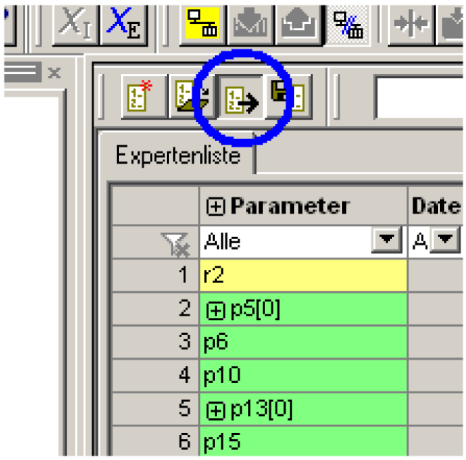
11 Process data exchange (drive): "Next" without change.



12 Finish.

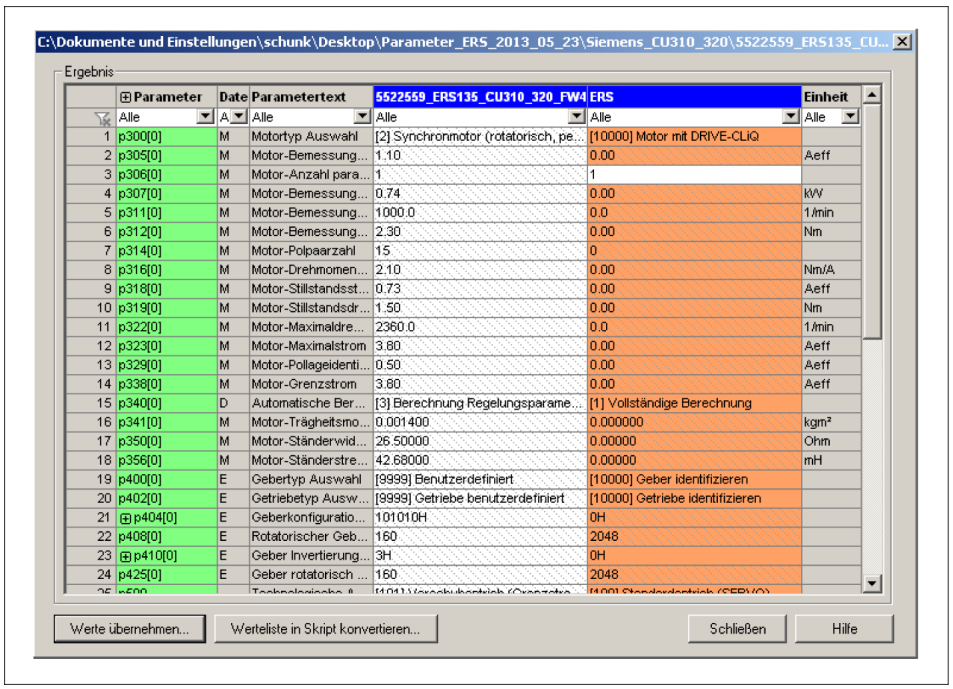


13 Open the expert list.



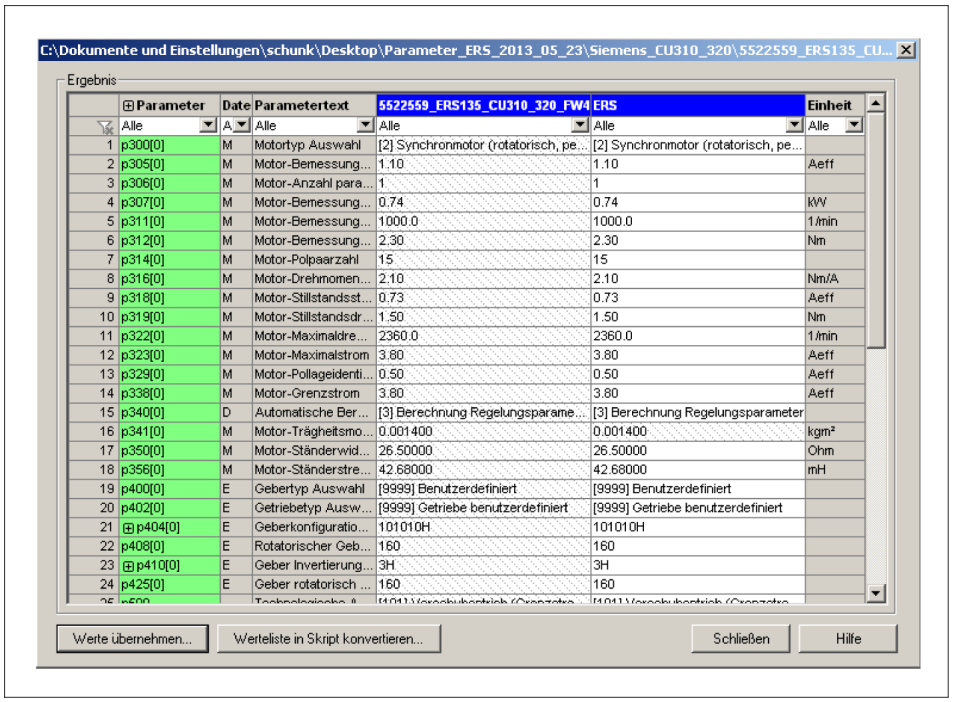
14 Select "Open user-defined value list".

15 Load the parameter file (e.g. ERS135) from the relevant drive.



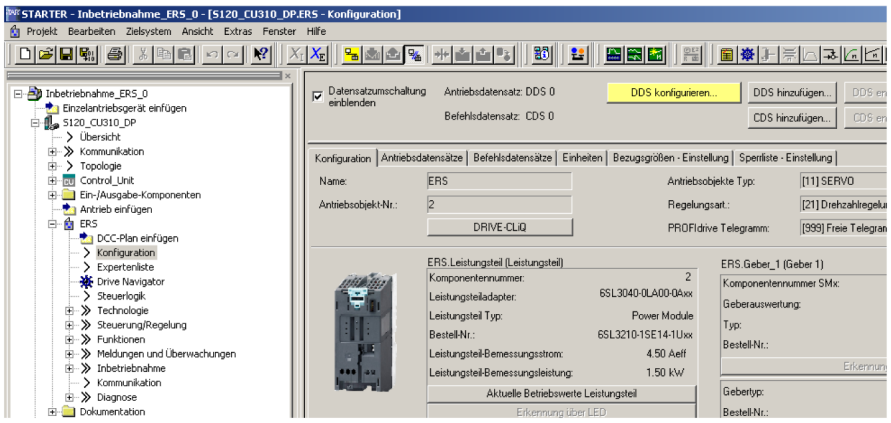
	Parameter	Date	Parametertext	5522559_ERS135_CU310_320_FW4	ERS	Einheit
	Alle	A	Alle	Alle	Alle	Alle
1	p300[0]	M	Motortyp Auswahl	[2] Synchronmotor (rotatorisch, pe...	[10000] Motor mit DRIVE-CLiQ	
2	p305[0]	M	Motor-Bemessung...	1.10	0.00	Aeff
3	p306[0]	M	Motor-Anzahl para...	1	1	
4	p307[0]	M	Motor-Bemessung...	0.74	0.00	kW
5	p311[0]	M	Motor-Bemessung...	1000.0	0.0	1/min
6	p312[0]	M	Motor-Bemessung...	2.30	0.00	Nm
7	p314[0]	M	Motor-Polpaarzahl	15	0	
8	p316[0]	M	Motor-Drehmomen...	2.10	0.00	Nm/A
9	p318[0]	M	Motor-Stillstandsst...	0.73	0.00	Aeff
10	p319[0]	M	Motor-Stillstandsdr...	1.50	0.00	Nm
11	p322[0]	M	Motor-Maximaldre...	2360.0	0.0	1/min
12	p323[0]	M	Motor-Maximalstrom	3.80	0.00	Aeff
13	p329[0]	M	Motor-Pollageidenti...	0.50	0.00	Aeff
14	p338[0]	M	Motor-Grenzstrom	3.80	0.00	Aeff
15	p340[0]	D	Automatische Ber...	[3] Berechnung Regelungsparame...	[1] Vollständige Berechnung	
16	p341[0]	M	Motor-Trägheitsmo...	0.001400	0.000000	kgm²
17	p350[0]	M	Motor-Ständerwid...	26.50000	0.00000	Ohm
18	p356[0]	M	Motor-Ständerstre...	42.68000	0.00000	mH
19	p400[0]	E	Gebertyp Auswahl	[9999] Benutzerdefiniert	[10000] Geber identifizieren	
20	p402[0]	E	Getriebetyp Ausw...	[9999] Getriebe benutzerdefiniert	[10000] Getriebe identifizieren	
21	⊞p404[0]	E	Geberkonfiguratio...	101010H	0H	
22	p408[0]	E	Rotatorischer Geb...	160	2048	
23	⊞p410[0]	E	Geber Invertierung...	3H	0H	
24	p425[0]	E	Geber rotatorisch ...	160	2048	

16 Overview of user-defined value list: "Accept values".



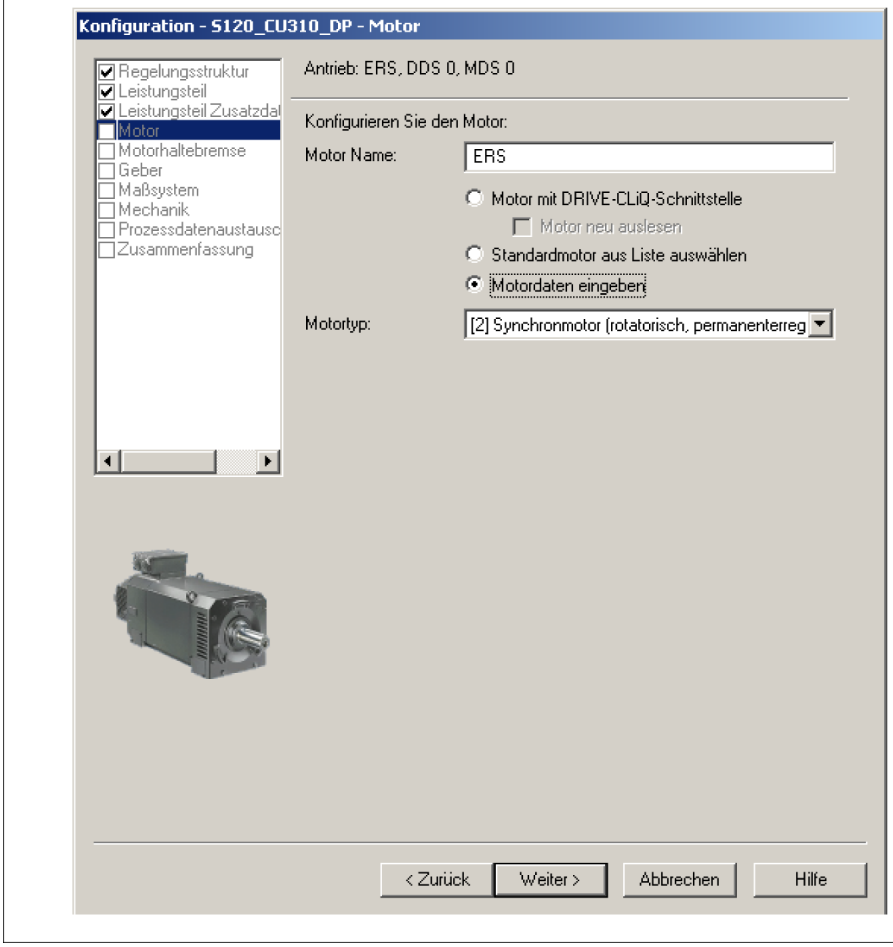
	Parameter	Date	Parametertext	5522559_ERS135_CU310_320_FW4	ERS	Einheit
	Alle	A	Alle	Alle	Alle	Alle
1	p300[0]	M	Motortyp Auswahl	[2] Synchronmotor (rotatorisch, pe...	[2] Synchronmotor (rotatorisch, pe...	
2	p305[0]	M	Motor-Bemessung...	1.10	1.10	Aeff
3	p306[0]	M	Motor-Anzahl para...	1	1	
4	p307[0]	M	Motor-Bemessung...	0.74	0.74	kW
5	p311[0]	M	Motor-Bemessung...	1000.0	1000.0	1/min
6	p312[0]	M	Motor-Bemessung...	2.30	2.30	Nm
7	p314[0]	M	Motor-Polpaarzahl	15	15	
8	p316[0]	M	Motor-Drehmomen...	2.10	2.10	Nm/A
9	p318[0]	M	Motor-Stillstandsst...	0.73	0.73	Aeff
10	p319[0]	M	Motor-Stillstandsdr...	1.50	1.50	Nm
11	p322[0]	M	Motor-Maximaldre...	2360.0	2360.0	1/min
12	p323[0]	M	Motor-Maximalstrom	3.80	3.80	Aeff
13	p329[0]	M	Motor-Pollageidenti...	0.50	0.50	Aeff
14	p338[0]	M	Motor-Grenzstrom	3.80	3.80	Aeff
15	p340[0]	D	Automatische Ber...	[3] Berechnung Regelungsparame...	[3] Berechnung Regelungsparameter	
16	p341[0]	M	Motor-Trägheitsmo...	0.001400	0.001400	kgm²
17	p350[0]	M	Motor-Ständerwid...	26.50000	26.50000	Ohm
18	p356[0]	M	Motor-Ständerstre...	42.68000	42.68000	mH
19	p400[0]	E	Gebertyp Auswahl	[9999] Benutzerdefiniert	[9999] Benutzerdefiniert	
20	p402[0]	E	Getriebetyp Ausw...	[9999] Getriebe benutzerdefiniert	[9999] Getriebe benutzerdefiniert	
21	⊞p404[0]	E	Geberkonfiguratio...	101010H	101010H	
22	p408[0]	E	Rotatorischer Geb...	160	160	
23	⊞p410[0]	E	Geber Invertierung...	3H	3H	
24	p425[0]	E	Geber rotatorisch ...	160	160	

17 Overview of user-defined value list: Continue with "Close".



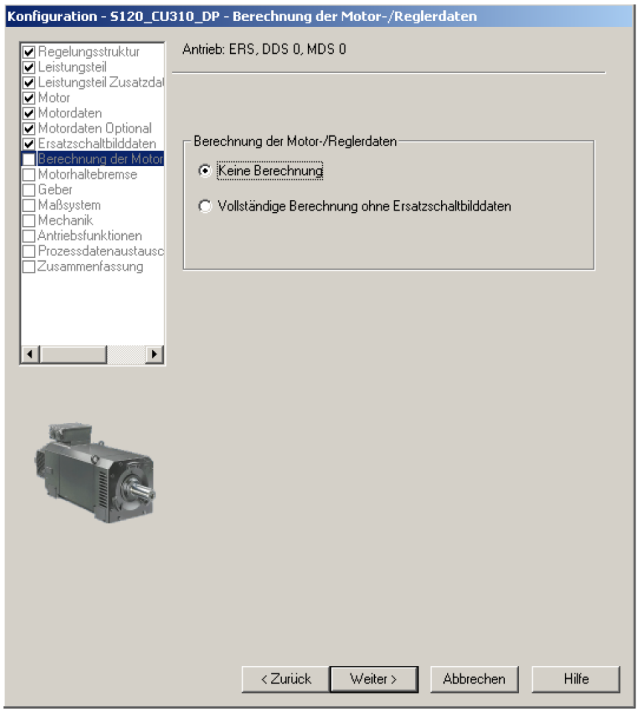
18 Double-click the drive and select "Configure DDS".

19 Accept the settings in steps 3, 4 and 5.



20 In the motor configuration step: Now select the "Enter motor data" field.

21 Confirm all fields without changes up to "Configuration of controller data".

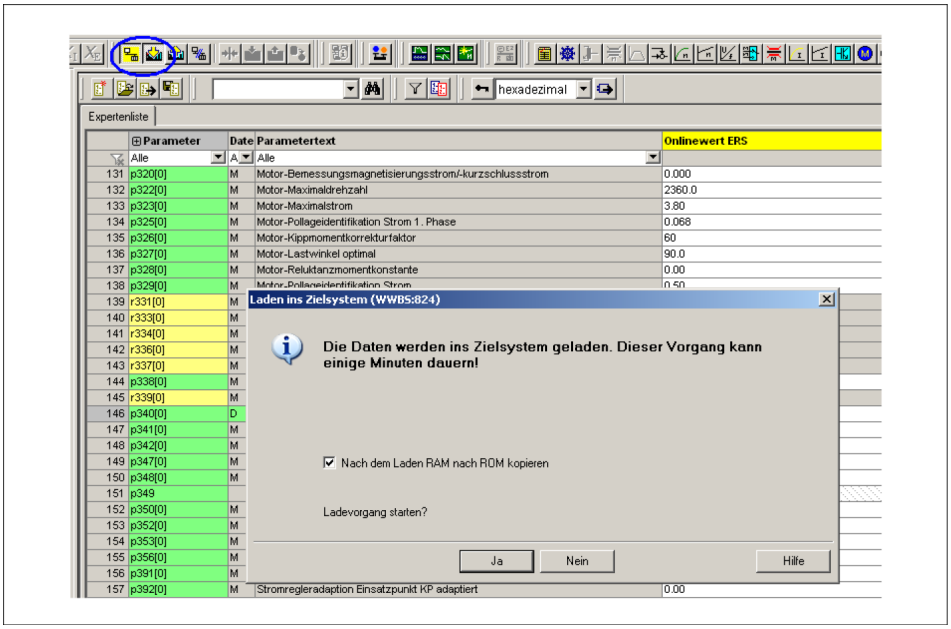


22 Select "No calculation" for "Calculation of the motor/controller data".

	NOTICE
	Selecting the "Complete calculation without mimic diagrams" field can cause irreparable damage to the drive!

23 Confirm all windows without changes up to the "Summary" window.

	NOTICE
	Before the drive is switched online and the parameters loaded into the target device, parameter P340 in the expert list must be set to the value [3] – "Calculation of control parameters"!



24 Switch the drive online and load the parameters into the target unit.

NOTE

With respect to the use of other functions:
Instruction manual for Siemens Sinamics S120 – series or contact the Siemens support team.

9.3 Inbetriebnahme des ERS mit einem beliebigen Umrichter

NOTE
This chapter is only a quick guide for the simple commissioning of the rotary module ERS with an arbitrary controller. Signigicant is the user's manual of the controller.

✓ **Before commissioning the controller read carefully the user´s manual of the controller.**

1 Connect electrical connections (power cable, signal cable) to the controller.

2 Check that the rotor can be turned freely.

3 Check that all required contact protection measures were taken for moving and live parts.

4 Switch on the controller and start the commissioning software.

5 Establish communication with the module and configure the controller.

6 Check the encoder signal and the signal of the temperature sensor.

7 Control the ERS and optimize the parameters.

8 Check the bearing noise at regular intervals. (☞ 12.2, Page 89).

NOTE
If the unit is referenced via the encoder's zero pulse, free motion must be ensured within the range of ± 360°.

- Using the ERS in a multiple axis system:
  Recommendation: put the axes into operation individually.
- To avoid collisions:
  Prior to the first movement, check the alignment of the ERS, the set direction of counting of the measuring system and the motor's direction of rotation.

10 Control parameters

10.1 Bosch Rexroth IndraDrive C/CS-Basic setting

Basic setting

1. Set position controller to:
   Kp = 0,5
2. Set velocity controller to:
   Kp = 1; Tn = 0
3. Set current control to:
   Kp = 30; Tn = 3
4. Set filter for speed control circuit:
   Speed controller smoothing time constant = 0

Setting the velocity controller

1. In velocity mode, run the motor at a constant velocity of 15 rpm.
2. Increase the Kp incrementally by 0.5 until the motor begins to vibrate.
3. Reduce the vibrations:
   by increasing the speed controller smoothing time constant.
   If this is not possible:
   Set the speed controller smoothing time constant to 0 and reduce the Kp until the vibrations cease.
4. Select the value that is half of the exact limit for Kp.
5. Select a high Tn value.
6. Reduce the Tn until the motor begins to vibrate.
7. Select the value that is double the exact limit for Tn.

Setting the position controller

1. Increase the Kp until the desired positioning time is achieved.

NOTE

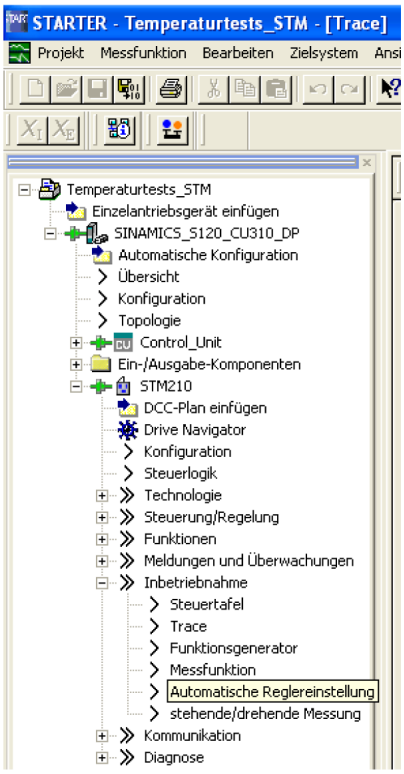
Pay attention that no overshoot occures.

2. Increase the Kp until the current curve is as smooth as desired. (Make the current curve visible using the oscilloscope function).

NOTE

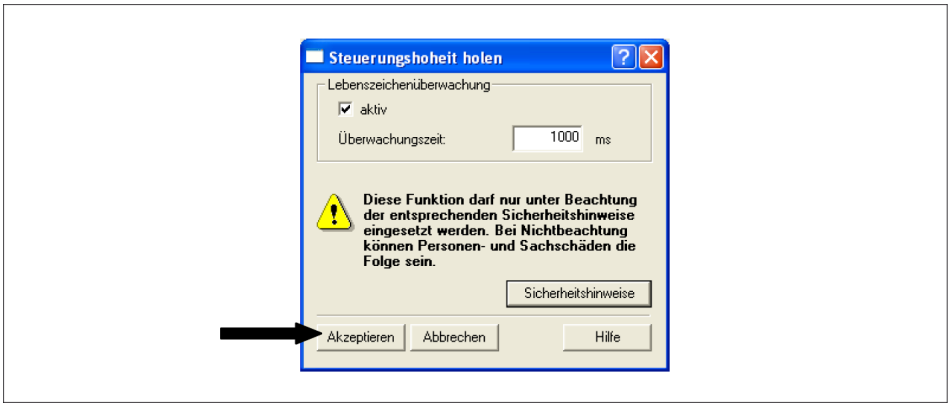
Be aware of noise emissions or vibrations!

10.2 Siemens Sinamics S120 - series

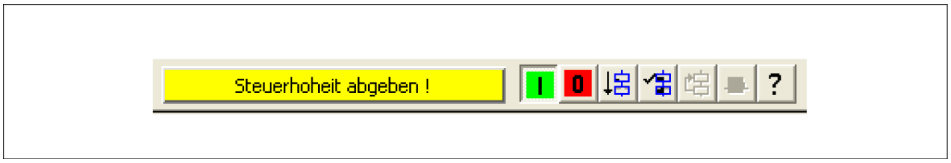


Siemens provides the "Automatic controller settings" function for the purpose of establishing the control parameters.

1 Select this function by clicking on the icon shown below:



2 Accept the safety note.

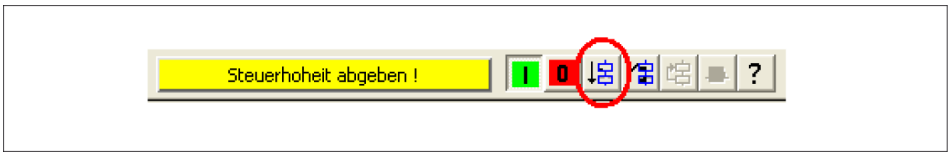


3 Enable the drive:

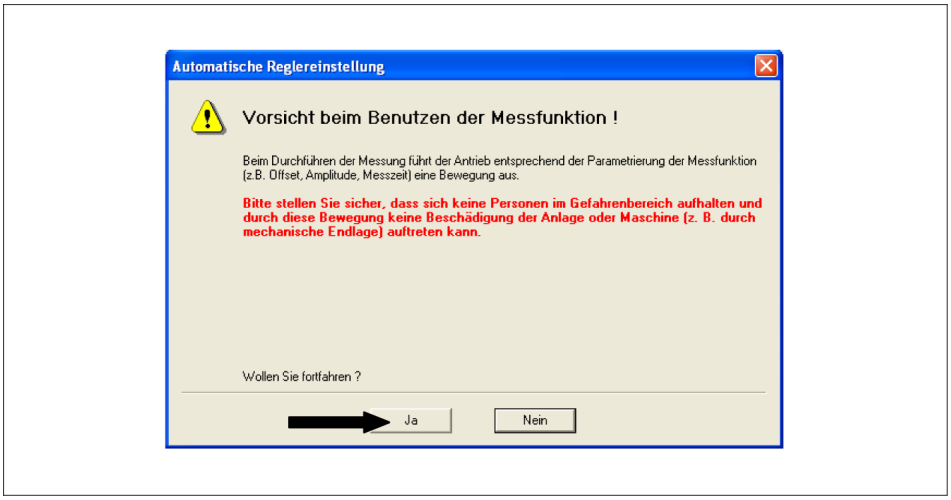
⇨ The individual steps required for determining the parameters can now be carried out.

Parameter determination

1 Ensure that no-one is positioned in the danger zone and that there is no potential for material damage.

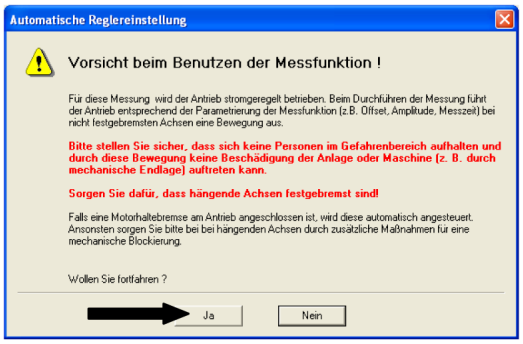


2 Click the button.

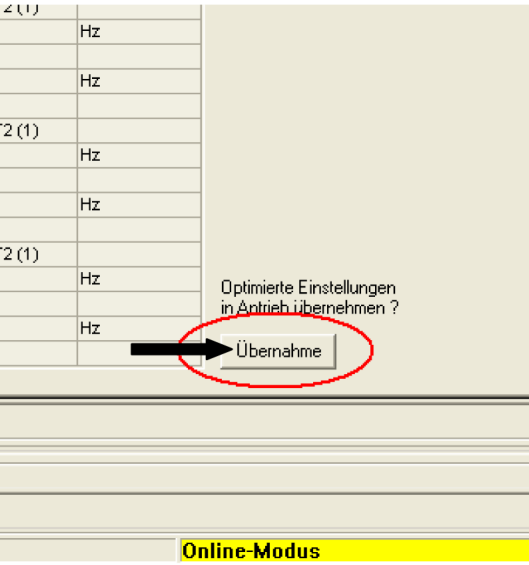

Automatische Reglereinstellung
Vorsicht beim Benutzen der Messfunktion !
Beim Durchführen der Messung führt der Antrieb entsprechend der Parametrierung der Messfunktion (z.B. Offset, Amplitude, Messzeit) eine Bewegung aus.
Bitte stellen Sie sicher, dass sich keine Personen im Gefahrenbereich aufhalten und durch diese Bewegung keine Beschädigung der Anlage oder Maschine (z. B. durch mechanische Endlage) auftreten kann.
Wollen Sie fortfahren ?
Ja
Nein

3 Acknowledge the warning:

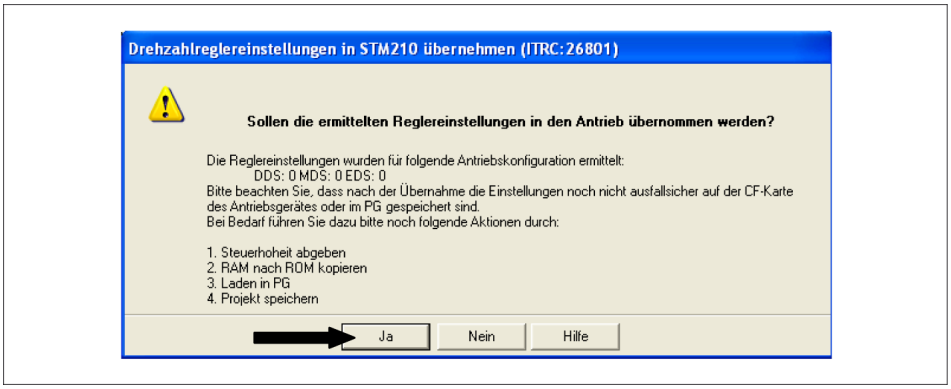
⇨ The control parameters are now determined automatically. In the first two steps, the mechanism is measured in the upper and lower frequency ranges.


Automatische Reglereinstellung
Vorsicht beim Benutzen der Messfunktion !
Für diese Messung wird der Antrieb stromgeregelt betrieben. Beim Durchführen der Messung führt der Antrieb entsprechend der Parametrierung der Messfunktion (z.B. Offset, Amplitude, Messzeit) bei nicht festgebremsten Achsen eine Bewegung aus.
Bitte stellen Sie sicher, dass sich keine Personen im Gefahrenbereich aufhalten und durch diese Bewegung keine Beschädigung der Anlage oder Maschine (z. B. durch mechanische Endlage) auftreten kann.
Sorgen Sie dafür, dass hängende Achsen festgebremst sind!
Falls eine Motorhaltebremse am Antrieb angeschlossen ist, wird diese automatisch angesteuert. Ansonsten sorgen Sie bitte bei bei hängenden Achsen durch zusätzliche Maßnahmen für eine mechanische Blockierung.
Wollen Sie fortfahren ?
Ja
Nein

4 Acknowledge the warning with "yes".



5 Click on "Accept".


Drehzahlreglereinstellungen in STM210 übernehmen (ITRC:26801)
Sollen die ermittelten Reglereinstellungen in den Antrieb übernommen werden?
Die Reglereinstellungen wurden für folgende Antriebskonfiguration ermittelt:
DDS: 0 MDS: 0 EDS: 0
Bitte beachten Sie, dass nach der Übernahme die Einstellungen noch nicht ausfallsicher auf der CF-Karte des Antriebsgerätes oder im PG gespeichert sind.
Bei Bedarf führen Sie dazu bitte noch folgende Aktionen durch:
1. Steuerhoheit abgeben
2. RAM nach ROM kopieren
3. Laden in PG
4. Projekt speichern
Ja
Nein
Hilfe

6 Click button "yes" to acknowledge the acceptance.

⇨ the new parameters can be transmitted to the controller.

⇨ The motor can now be operated with the new parameters.

NOTE

The Siemens auto tuning process selects a fairly hard controller setting, which can result in high noise emissions.
To reduce the noise emission, it is recommended that the gain Kp of the speed controller to reduce by 30-50%.

11 Trouble shooting

11.1 ERS dreht sich nicht

Possible cause	Corrective action
Interruption in the supply lines	• Check the supply lines for defects. • Check the electrical connections. Electrical connection.
No motion release	• Check the controller settings.
Controller is defective	• **DANGER! Risk of fatal injuries due to electric shock!** Check whether there is voltage at the controller's output. If there is no voltage: • Check the connection pin assignment Electrical connection, see operating manual for the controller.
Communication between master and controller is interrupted	• Check the communicaion.
Rotor is blocked mechanically	• Check the mechanical components. • Check the evenness at the mounting surfaceMechanical connection.
Shaft encoder defective	• Check shaft encoder and its connection. If a defect is detected: • ERS must be sent to SCHUNK with a repair order.
Short-circuit between turns in the motor	• Check the connection resistance with a multimeter, (☞ 6, Page 20). If the difference between the individual motor phases exceeds 0.1 Ohm: • ERS must be sent to SCHUNK with a repair order.
Short-circuit to ground due to moisture or short-circuit to ground due to electrical defect	• Check the protective conductor. • Check the electrical connection and connectors for ground leakage. If the ERS has a ground leak while the power cable is disconnected: • ERS must be sent to SCHUNK with a repair order.
Incorrect phase connections	• Check the electrical connections Electrical connection.

Possible cause	Corrective action
Incorrect controller settings	• Check the parameters and setting values, see operating manual for the controller.
Motor phases or encoder signals confused	• Check the electrical connections Electrical connection. • Check the encoder signals and the shielding of the encoder cable.

11.2 ERS has regulation difficulties

Possible cause	Corrective action
Controller settings not ideal	• Check the controller settings (direction of rotation of motor and encoder direction of counting).

11.3 ERS oscillates

Possible cause	Corrective action
Motor overload	• Check the dimensioning. • Reduce the load. • Check the controller settings.
Controller settings not ideal	• Check the controller settings.

11.4 Bearing noise

Possible cause	Corrective action
Incorrect assembly	• Check the evenness at the mounting surface, Mechanical connection.
Bearing defective due to overload	• ERS must be sent to SCHUNK with a repair order.

11.5 Error message for the winding temperature

Possible cause	Corrective action
The electrical connection to the temperature sensor is faulty	• Check resistance between the controller and the temperature sensor in the ERS. If necessary: • replace the electrical connection.
Temperature sensor defective	• Check the resistance of the temperature sensor. If the resistance exceeds 630 Ohms at room temperature: • ERS must be sent to SCHUNK with a repair order.
Thermal motor overload	• Reduce the load. • Mount the motor on heat-conducting materials to dissipate excess motor heat.
Rotor is blocked mechanically	• Check the mechanical components. • Check the evenness at the mounting surface, Mechanical connection.
Encoder signals are faulty; encoder line shielding is not corrected.	• Check the encoder's power supply. • Check the encoder signals and the shielding of the encoder cable.
The electrical connection to the temperature sensor is faulty	• Check resistance between the controller and the temperature sensor in the ERS. If necessary: • replace the electrical connection.
Motor overload; overvoltage or undervoltage:	• Check the dimensioning. • Reduce the load. • Check the controller settings. • Check the output power supply.

12 Maintenance and care

12.1 Maintenance and lubrication intervals

DANGER

Risk of fatal injuries due to electric shock!
If the electrical connections are released from the live module, arcing may be the result.

- Switch off the energy supply.
- Only have work on the module performed by appropriately trained specialist personnel.

NOTICE

At ambient temperature above 60°C the lubricants can harden faster.

- Interval decrease accordingly.

Recommendation

Maintenance and seal replacement should be done by SCHUNK because the rotor must be aligned and assembled with an assembly device.

Maintenance intervals

Size	ERS 048V
Interval [Mio. cycles] Bearing lubrication [h]	20,000
Visual inspection [h]	2,500

This information refers to use under normal operating and ambient conditions:

- Clean workshop atmosphere
- No splashing water
- Small amounts of abrasive and process dust

12.2 Module Servicing

For maintenance work or repairs, send the complete module along with a repair order to SCHUNK.

Visual inspection

The regular visual inspection of all supply lines is the prerequisite for the perfect operation of the ERS.

1 If supply lines are defective, put the machine out of operation immediately.

2 Replace damaged connection cables.

3 ACheck the ERS every 2500 operating hours or once a year for bearing noise:

Acoustic bearing inspection

Bearing noise	Further procedure
Smooth noise (typical bearing noise)	Everything okay, ERS can continue to be operated.
Uneven grinding noise	The motor is not set up correctly: • check the evenness of the mounting surfaces Mechanical connection.
Loud and uneven noise / motor not running smoothly	The motor is not set up correctly: • check the evenness of the mounting surfaces Mechanical connection. bearings defective: • Send the ERS to SCHUNK along with a repair order.

Cleaning

Clean the ERS dry at regular intervals to remove all dirt.

If the housing is soiled, please only rub it dry, e.g. with a cloth. Do not immerse or spray!

When all maintenance work has been completed:
Refit the safety devices provided, such as covers and safety switches.

12.3 Modul zerlegen

The module may only be disassembled and repaired by SCHUNK, otherwise injuries to mechanism may occur.

Non-compliance will invalidate the warranty.

13 Transport, storage and disposal

13.1 Transport

- The packaging must protect the drive from all external effects (such as mechanical shocks and humidity).
- Protect the module from shocks.
- Package the module in such a way that the electrical supply lines do not obstruct transport and are not damaged themselves.
- Comply with climatic category 2K3 in accordance with EN50178.
- Transport temperature -5°C (+23°F) to +60°C (+140°F), with maximum fluctuations of 20 K/hour.
- Transport air humidity: relative humidity of 5%-95%, non-condensing.
- During transport and handling, make sure that none of the components are bent or insulation space is changed.
- The ERS contains components that are sensitive to electrostatic charge. Avoid any electrostatic charging of the ERS.

13.2 Packaging

- Cardboard packaging with paper foaming.
- The maximum stacking height is **three modules**.

13.3 Storage

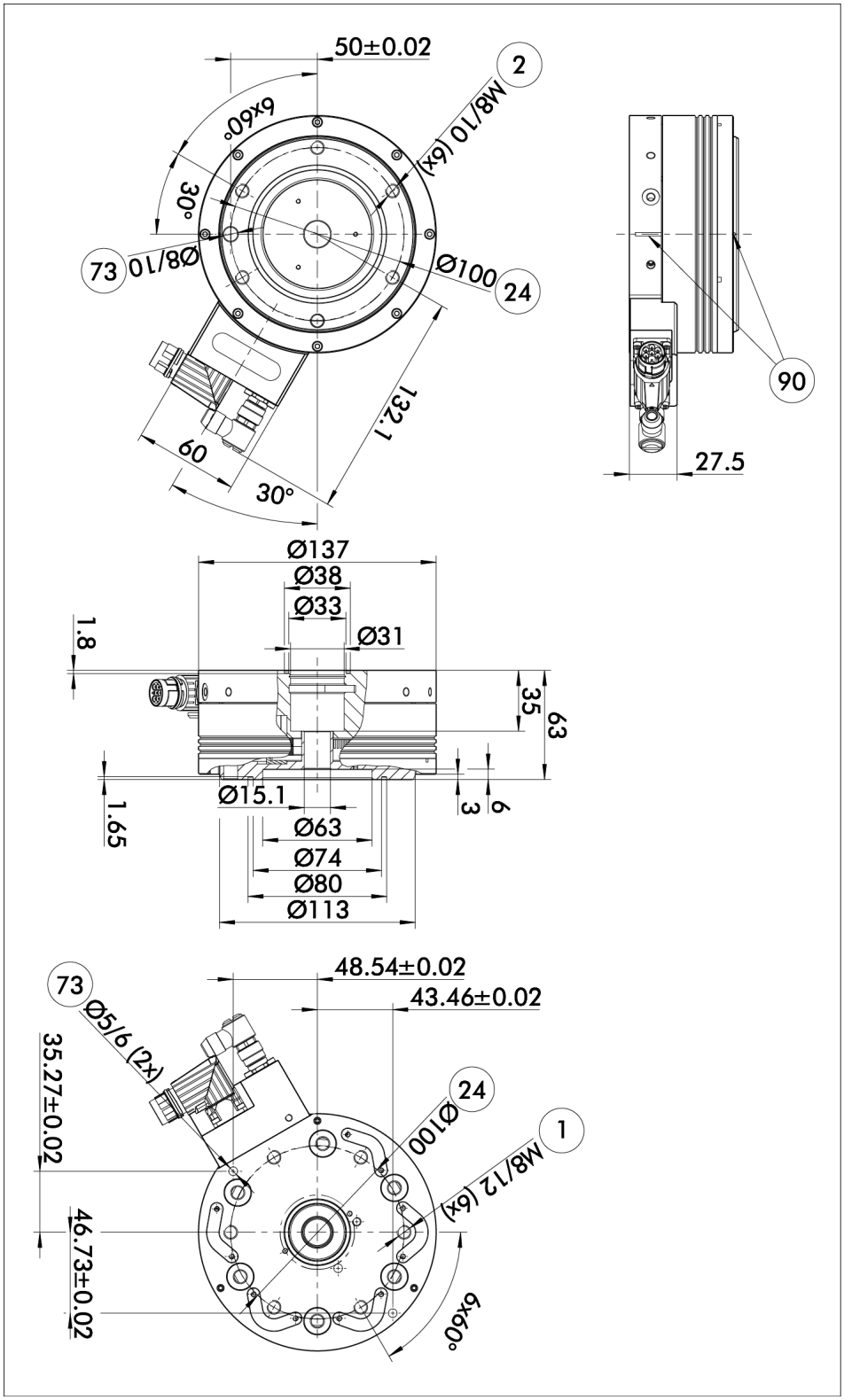
- Protect the product against the effects of humidity
- The storage temperature should be between +5°C and +60°C.
- The storage location must be clean, dry and well ventilated.
- No outdoor storage permitted.
- No condensation permitted!
- Comply with climatic category 1K4 in accordance with EN50178.
- Observe the maximum stacking height of three packaged modules.

13.4 Disposal

- Observe the locally valid legal disposal regulations.
- Environmentally sound disposal via the corresponding recycling or workshop centers.
- SCHUNK GmbH & Co. KG accepts no liability for the consequences of incorrect disposal by the customer.

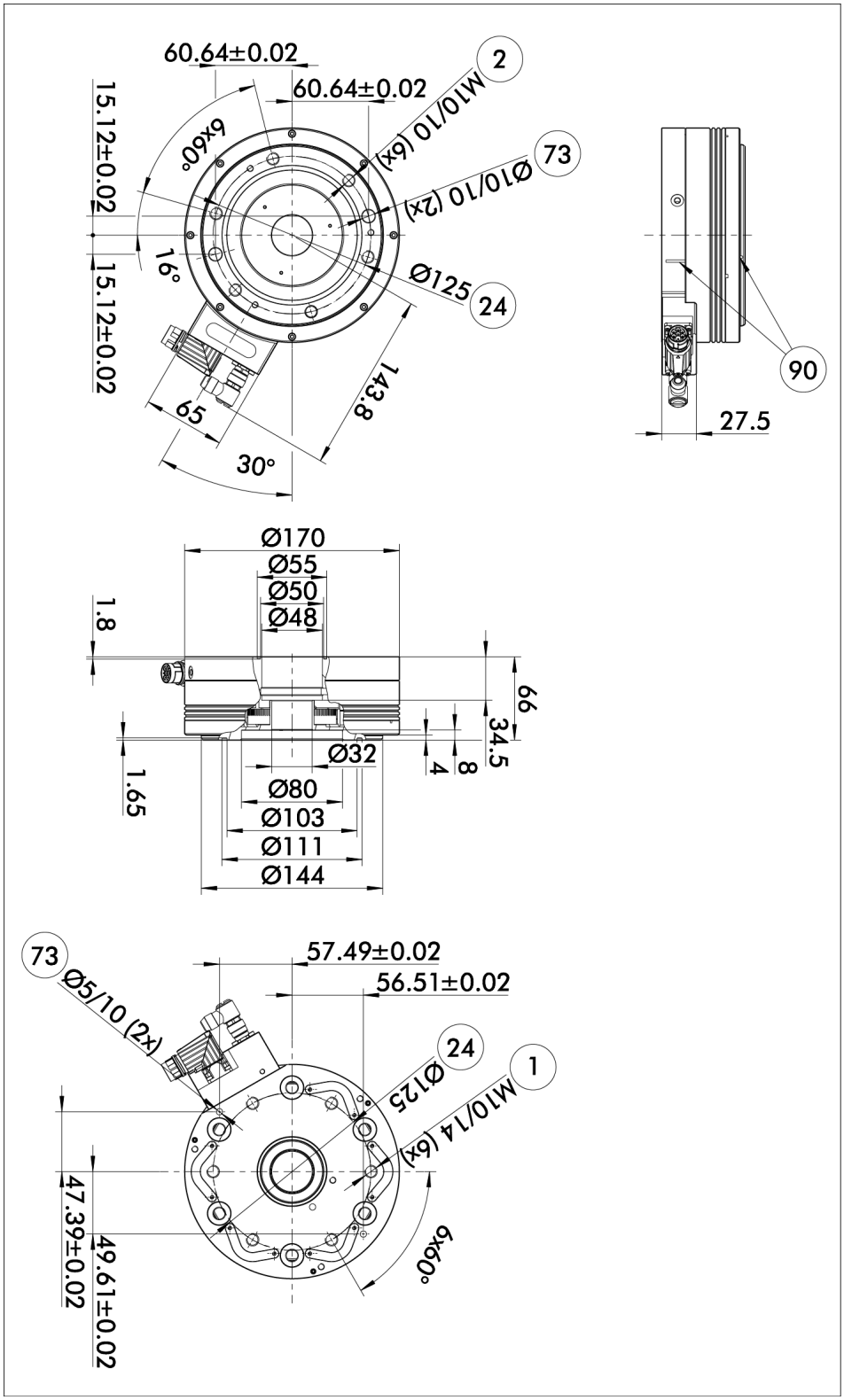
14 Assembly drawings

14.1 ERS 135



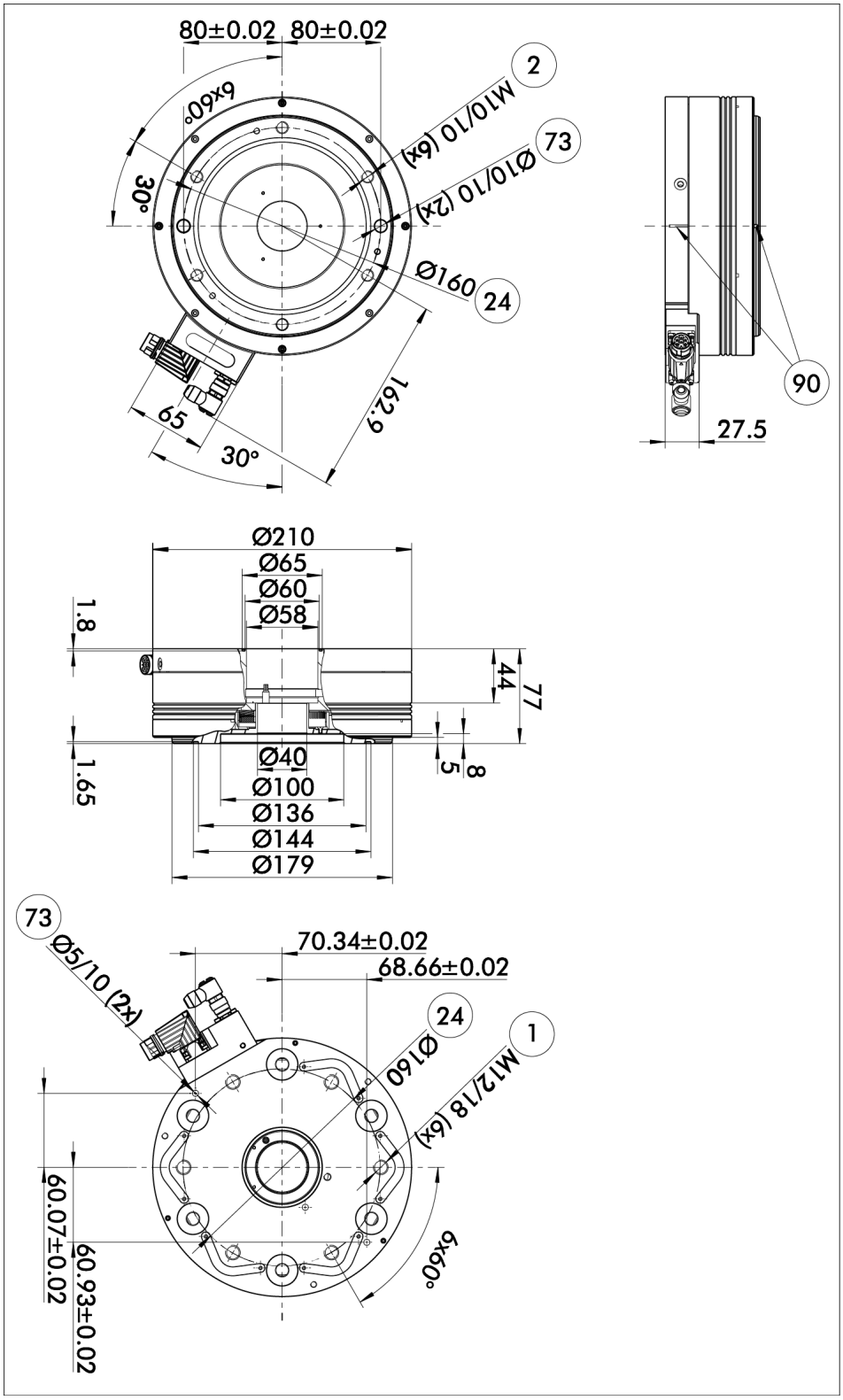
Assembly drawing ERS 135

14.2 ERS 170



Assembly drawing ERS 170

14.3 ERS 210



Assembly drawing ERS 210

15 Translation of original declaration of incorporation

in terms of the Directive 2006/42/EG, Annex II, Part 1.B of the European Parliament and of the Council on machinery.

Manufacturer/ Distributor	SCHUNK GmbH & Co. KG Spann- und Greiftechnik Bahnhofstr. 106 – 134 D-74348 Lauffen/Neckar

We hereby declare that on the date of the declaration the following incomplete machine complied with all basic safety and health regulations found in the directive 2006/42/EC of the European Parliament and of the Council on machinery. The declaration is rendered invalid if modifications are made to the product.

Product designation:	Electric rotary module / ERS 135 - 210 / 560V / elektric
ID number	0310146, 0310150, 0310178, 0310180, 0310182, 0310184, 0310210, 0310212, 0310214, 0310216

The product also complies with **LVD Directive (2006/95/EC)** .

Applied harmonized standards, especially:

EN ISO 12100:2011-03	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1: 2006	Safety of machinery - Electrical equipment of machines, Part 1: General requirements (IEC 60204-1:2005 (modified))
EN 61000-6-2: 2005	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments (IEC 61000-6-2:2005)
EN 61000-6-4:2007	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards Emission standard for industrial environments (IEC 61000-6-4:2006)
EN ISO 9409-1:2004	Industrial robots - Mechanical interfaces - Part 1: Plates (ISO 9409-1:2004); German version EN ISO 9409-1:2004

The incomplete machine may not be put into operation until conformity of the machine into which the incomplete machine is to be installed with the provisions of the Machinery Directive (2006/42/EC) is confirmed.

The manufacturer agrees to forward on demand the relevant technical documentation for the partly completed machinery to state offices.
The special technical documents according to Appendix VII, Part B belonging to the incomplete machine have been compiled.

Person authorized to compile the technical documentation:
Robert Leuthner, Address: see manufacturer's address

Signature – see original declaration

Lauffen/Neckar, February 2015

Ralf Winkler;
Business Unit Manager
R & D Mechanical Gripping Systems

15.1 Annex to Declaration of Incorporation

according 2006/42/EG, Annex II, No. 1 B

1.Description of the essential health and safety requirements pursuant to 2006/42/EC, Annex I that are applicable and that have been fulfilled with:

Product designation	Electric rotary module
Type designation	ERS
ID number	0310146, 0310150, 0310178, 0310180, 0310182, 0310184, 0310210, 0310212, 0310214, 0310216

To be carried out by the system integrator for the complete machine		⇓
Fulfilled for the scope of the incomplete machine	⇓	
Not relevant	⇓	

1.1	**Essential Requirements**			
1.1.1	Definitions		X	
1.1.2	Principles of safety integration		X	
1.1.3	Materials and products		X	
1.1.4	Lighting		X	
1.1.5	Design of machinery to facilitate its handling		X	
1.1.6	Ergonomics		X	
1.1.7	Operating positions			X
1.1.8	Seating			X

1.2	**Control Systems**			
1.2.1	Safety and reliability of control systems		X	
1.2.2	Control devices		X	
1.2.3	Starting		X	
1.2.4	Stopping		X	
1.2.4.1	Normal stop		X	
1.2.4.2	Operational stop		X	
1.2.4.3	Emergency stop		X	

1.2	Control Systems			
1.2.4.4	Assembly of machinery		X	
1.2.5	Selection of control or operating modes		X	
1.2.6	Failure of the power supply			X

1.3	Protection against mechanical hazards			
1.3.1	Risk of loss of stability			X
1.3.2	Risk of break-up during operation			X
1.3.3	Risks due to falling or ejected objects			X
1.3.4	Risks due to surfaces, edges or angles		X	
1.3.5	Risks related to combined machinery			X
1.3.6	Risks related to variations in operating conditions			X
1.3.7	Risks related to moving parts		X	
1.3.8	Choice of protection against risks arising from moving parts			
1.3.8.1	Moving transmission parts		X	
1.3.8.2	Moving parts involved in the process			X
1.3.9	Risks of uncontrolled movements			X

1.4	Required characteristics of guards and protective devices			
1.4.1	General requirements			X
1.4.2	Special requirements for guards			X
1.4.2.1	Fixed guards			X
1.4.2.2	Interlocking movable guards			X
1.4.2.3	Adjustable guards restricting access			X
1.4.3	Special requirements for protective devices			X

1.5	Risks due to other hazards			
1.5.1	Electricity supply		X	
1.5.2	Static electricity		X	
1.5.3	Energy supply other than electricity		X	
1.5.4	Errors of fitting		X	
1.5.5	Extreme temperatures			X
1.45.6	Fire			X
1.5.7	Explosion			X
1.5.8	Noise			X

1.5	Risks due to other hazards			
1.5.9	Vibrations			X
1.5.10	Radiation	X		
1.5.11	External radiation	X		
1.5.12	Laser radiation	X		
1.5.13	Emissions of hazardous materials and substances			X
1.5.14	Risk of being trapped in a machine	X		
1.5.15	Risk of slipping, tripping or falling	X		
1.5.16	Lightning	X		

1.6	Maintenance			
1.6.1	Machinery maintenance	X	X	
1.6.2	Access to operating positions and servicing points		X	
1.6.3	Isolation of energy sources		X	
1.6.4	Operator intervention		X	
1.6.5	Cleaning of internal parts		X	

1.7	Information			
1.7.1	Information and warnings on the machinery	X	X	
1.7.1.1	Information and information devices		X	
1.7.1.2	Warning devices		X	
1.7.2	Warning of residual risks	X	X	
1.7.3	Marking of machinery	X		
1.7.4	Instructions	X		
1.7.4.1	General principles for the drafting of instructions	X		
1.7.4.2	Contents of the instructions	X		
1.7.4.3	Sales literature	X		

	The classification from Annex 1 is to be supplemented from here forward.			
2	Supplementary essential health and safety requirements for certain categories of machinery			X
2.1	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products			X
2.2	Portable hand-held and/or guided machinery			X
2.2.1	Portable fixing and other impact machinery			X

	The classification from Annex 1 is to be supplemented from here forward.			
2.3	Machinery for working wood and material with similar physical characteristics			X
3	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery		X	
4	Supplementary essential health and safety requirements to offset hazards due to lifting operations		X	
5	Supplementary essential health and safety requirements for machinery intended for underground work			X
6	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of persons		X	X

Notes